Pit and Quarry

With which is consolidated

CEMENT-MILL & QUARRY

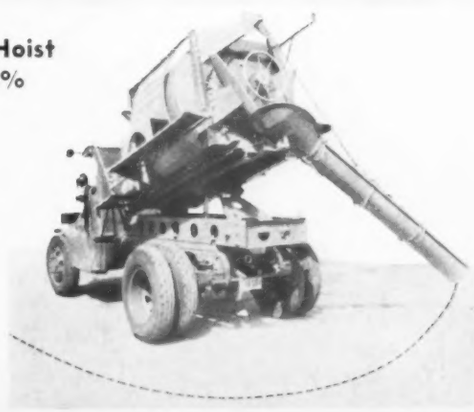
January, 1936

More Concrete is being sold today with JAEGER TRUCK MIXERS than by any other method . . . Write for 1936 catalog of latest DUAL-SPEED Models, built of MAN-TEN Steel.

The JAEGER MACHINE CO.
602 DUBLIN AVE., COLUMBUS, OHIO

Jaeger "REAR LIFT" Hoist Attachment Gives 75% More Spouting Area Where Needed!

Jaeger One-Man Chute, of Man-Ten Steel, Saves Minutes Every Trip

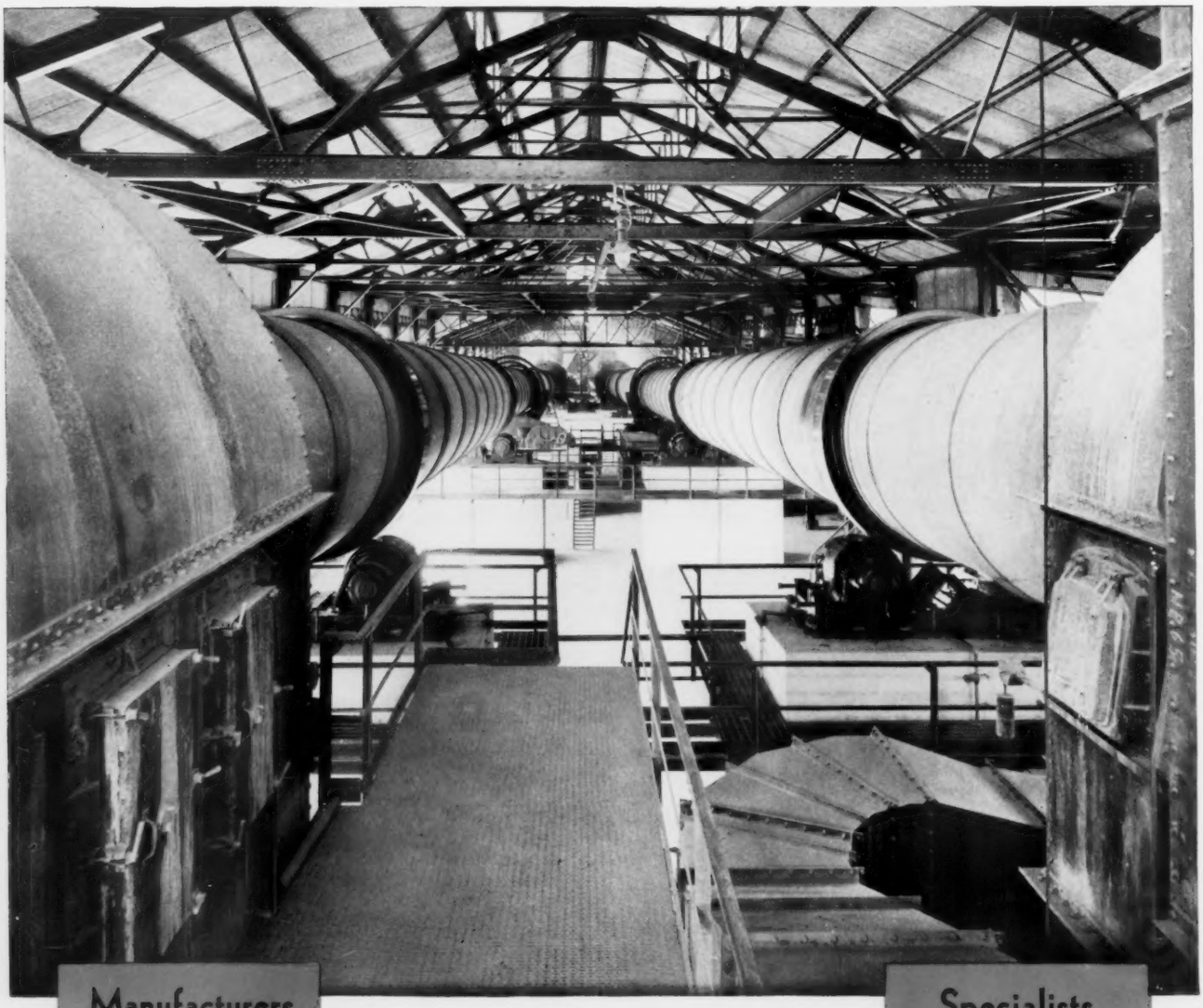


TN1
.P65

MODERNIZE TO ECONOMIZE

Lower the cost of Production
Improve the Quality of Product
by Utilizing Modern

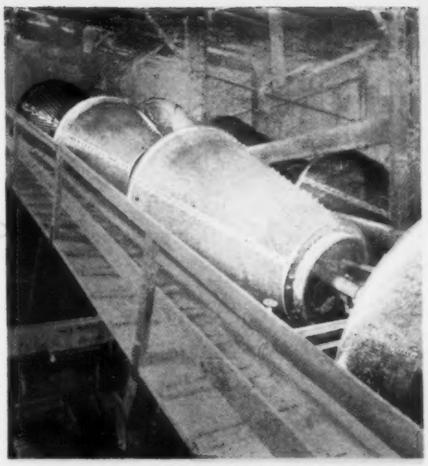
CEMENT MAKING MACHINERY
CEMENT PLANT ENGINEERING

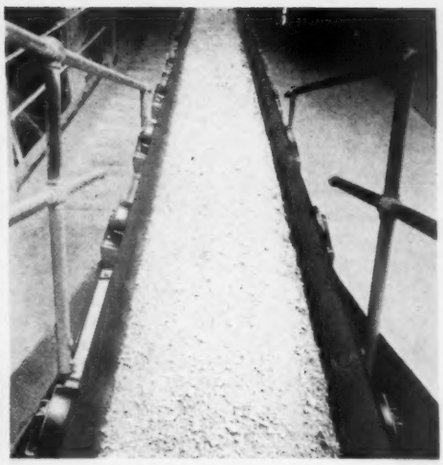


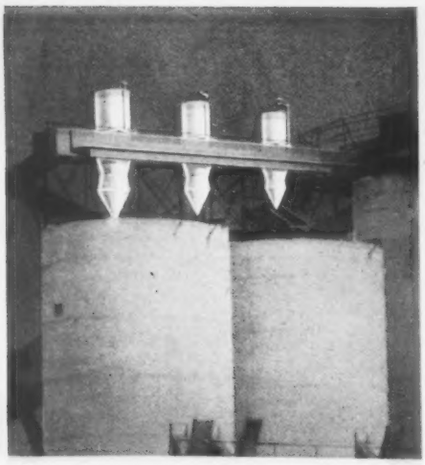
Manufacturers of a complete Line of Modern CEMENT MAKING MACHINERY

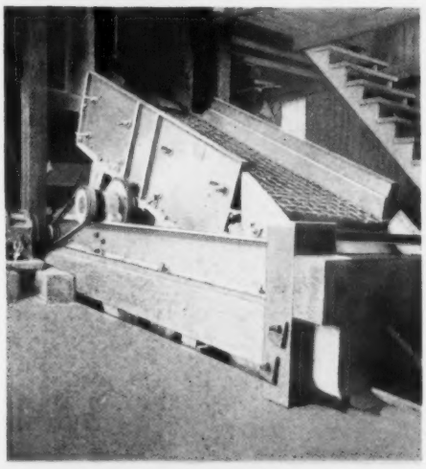
F. L. SMIDTH & CO.
225 BROADWAY, NEW YORK

Specialists in Engineering of Modern CEMENT MAKING FACTORIES









HANDLING— PREPARATION EQUIPMENT by LINK-BELT

The complete Link-Belt line includes every form of mechanical handling and preparation equipment—for washing, grading, elevating, conveying; as well as excavating.

Link-Belt has brought to the highest point of standardization, commensurate with sound engineering, the elements of handling and preparation equipment, and the positive power transmitting units for them. Link-Belt designs offer economy and flexibility of layout, with equipment developed for specialized services. Send for catalog No. 1240.

LINK-BELT COMPANY

The Leading Manufacturer of Equipment for Handling Materials and Transmitting Power

CHICAGO PHILADELPHIA
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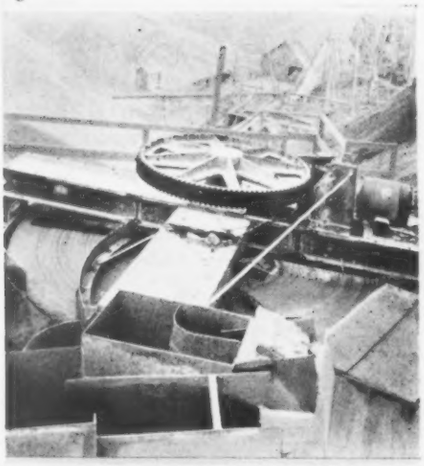

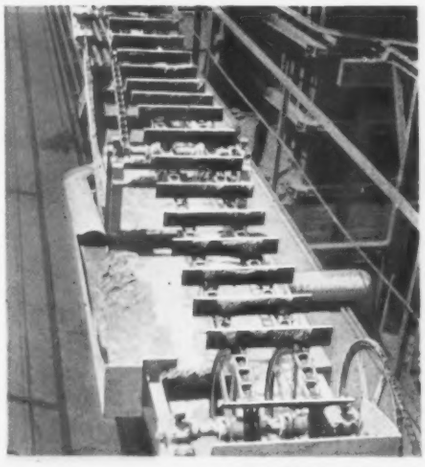

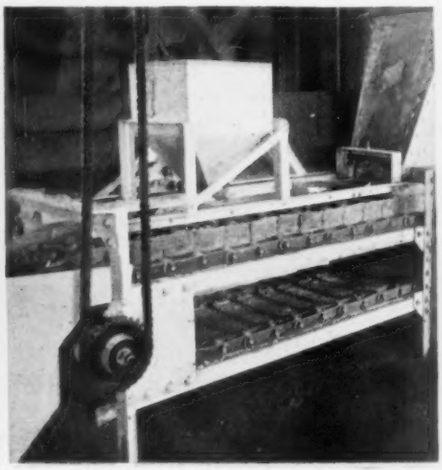

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Pit and Quarry

With which is consolidated
CEMENT-MILL & QUARRY

Volume 28 JANUARY, 1936 Number 7

MEMBER AUDIT BUREAU OF CIRCULATIONS

Published on the first of each month for producers and manufacturers of Cement, Crushed Stone, Gypsum, Lime, Sand, Gravel and other nonmetallic minerals. Entered as second-class matter November 28, 1932, at the Postoffice at Chicago, Ill., under the Act of March 3, 1897.

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COMPLETE SERVICE PUBLISHING CO.
538 South Clark St.
Chicago, Ill.

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Subscription price: $2 for 3 years, $1 for 1 year in the United States and possessions, Canada, and Central and South America; elsewhere $1 additional for each year.
Single copies 20 cents.

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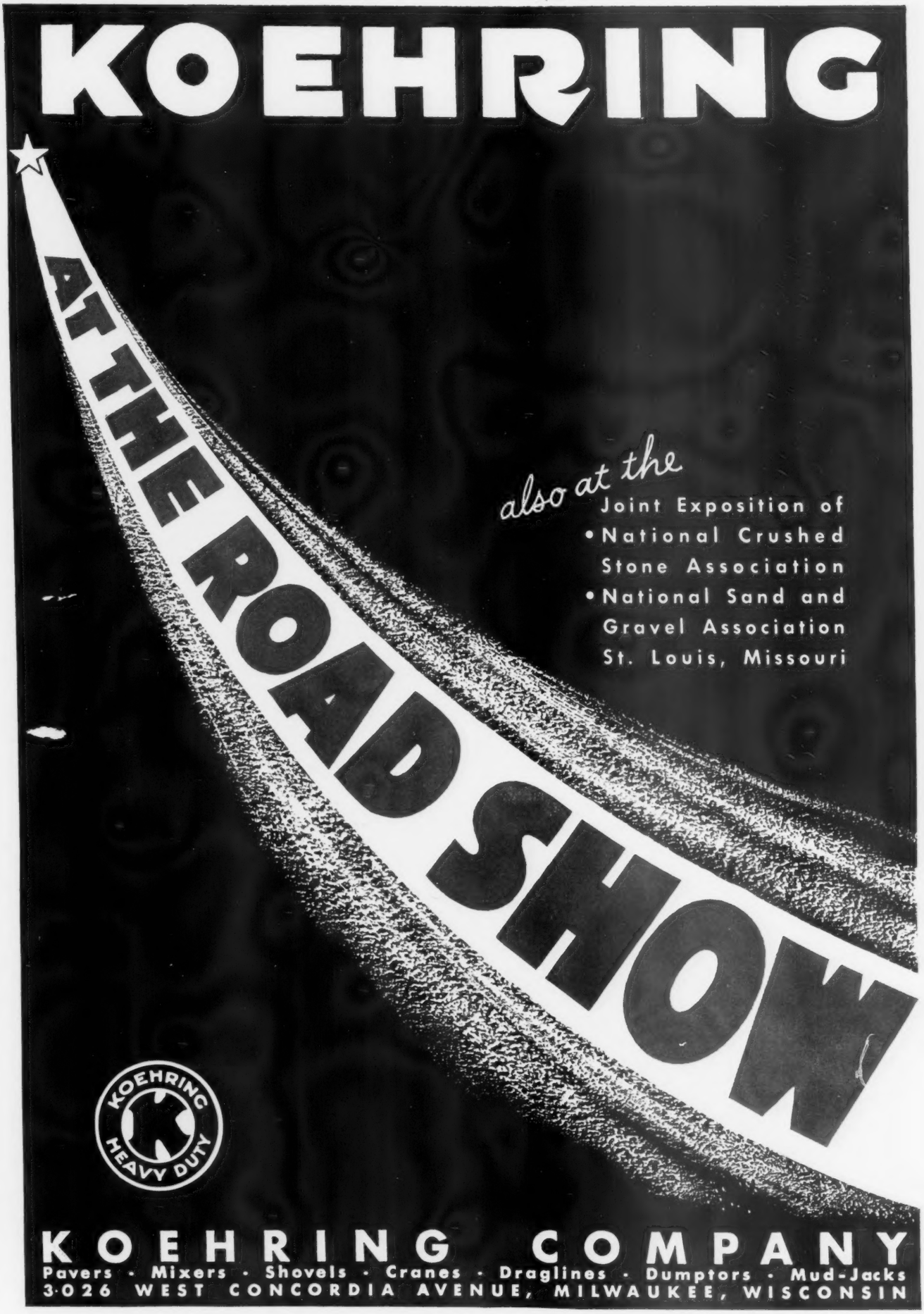

KOEHRING
AT THE ROAD SHOW
also at the
Joint Exposition of
• National Crushed Stone Association
• National Sand and Gravel Association
St. Louis, Missouri
KOEHRING
HEAVY DUTY
KOEHRING COMPANY
Pavers · Mixers · Shovels · Cranes · Draglines · Dumptors · Mud-Jacks
3026 WEST CONCORDIA AVENUE, MILWAUKEE, WISCONSIN

1885 DECEMBER

FIFTY

An Anniversary

GRUENDLER rounds out a full half-century of service to industry, and now enters the fifty-first year of successful machinery manufacture.

Gruendler Crushing, Grinding and Material Handling Equipment has not only kept pace with modern progress, but has also led the way to more efficient and profitable methods of road building and construction work.

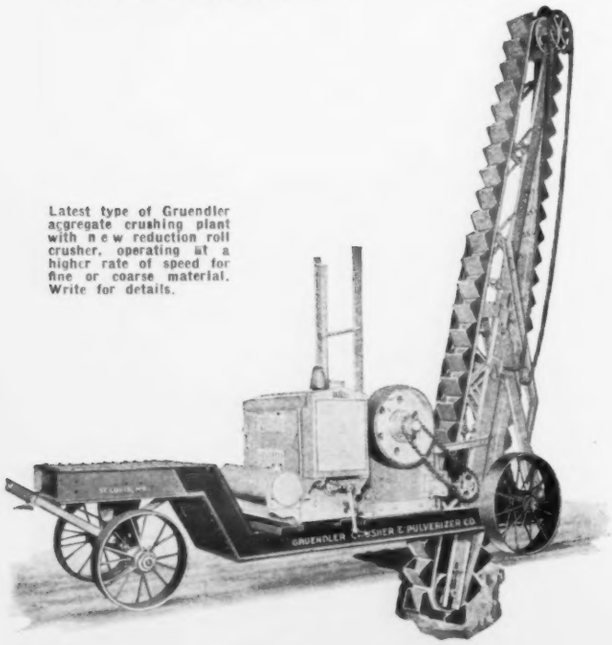
The present-day trend toward portable units is fully met by a complete line of Gruendler self-contained plants for crushing, washing, screening, conveying and loading—for all capacities, all conditions, and all types of materials.

To progressive operators in 1936, Gruendler now offers new opportunities for cost reduction and improved quality of materials in the greatest year of road building and government work in history. We welcome your inquiries on our new models for 1936.

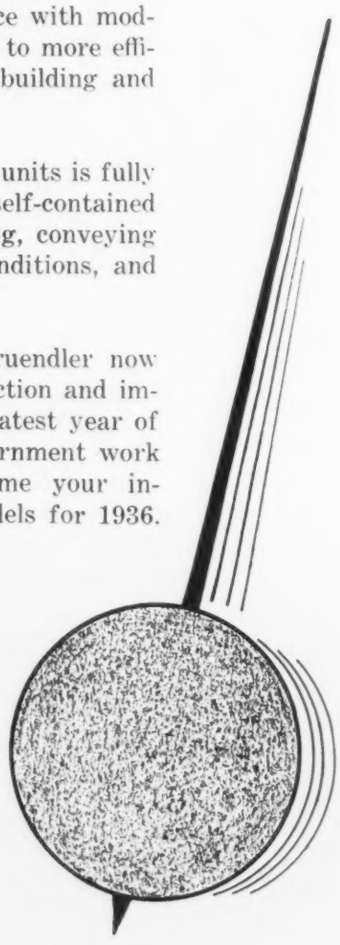
928 N. 1st Street

Original Gruendler Plant

Erected in latter part of 1885—"down by the river." The humble beginning of a nation-wide organization.



Latest type of Gruendler aggregate crushing plant with new reduction roll crusher, operating at a higher rate of speed for fine or coarse material. Write for details.



the march

GRUENDLER CRUSHER & PULVERIZER

YEARS 1936 JANUARY

An Invitation

GRUENDLER cordially invites the members and guests of the St. Louis Convention of the Sand, Gravel, Slag and Crushed Stone Producers Association—to visit the modern Gruendler plant and see the working demonstration of the latest type of Portable Crushing Units and other 1936 models of Gruendler machinery. Free bus service will be provided from the Convention Hall to the Gruendler Plant for the convenience of those wishing to make the trip.

Congratulations

to the Sand, Gravel, Slag and Crushed Stone Producers Association for this splendid Convention.

You will be welcome at the Gruendler booth at the Cleveland Road Show

of time

Modern GRUENDLER Plant of Today

Efficiently equipped for the production of Crushing, Grinding and Material Handling Machinery for the needs of industry.

COMPANY, 2915-17 N. Market St., St. Louis, Mo.

HEITZMAN SAFETY BLASTING PLUG

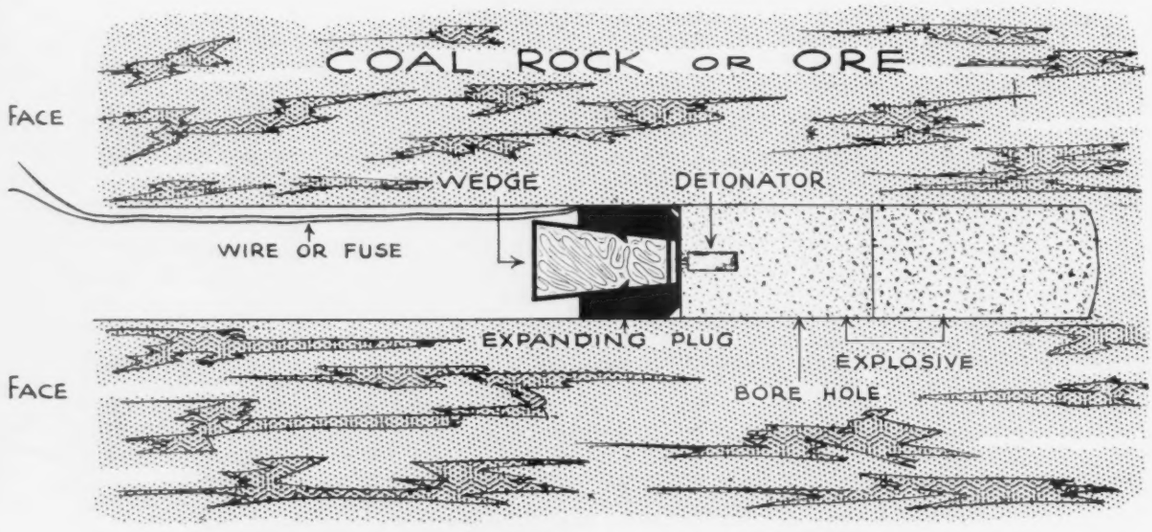
Patented

FOR

. BLASTING IN HIGHWAY CONSTRUCTION.

ROCK, CEMENT, GYPSUM, GRANITE & LIME

QUARRIES



CROSS SECTION SHOWING APPLICATION OF THE PLUG

A SUBSTITUTE FOR STEMMING

SAFE! EFFICIENT! ECONOMICAL!

PAYS FOR ITSELF SEVERAL TIMES OVER

1. The Heitzman Safety Blasting Plug is a substitute for stemming and acts as a safety device in case of misfires.
2. In case of misfire, a small charge is placed on top of the first plug, and then fired with another plug. The detonation will fire through the first plug.
3. The plug seals the charge airtight **which produces more ore, coal or rock with less explosives.**
4. **The plug is the only stemming required.**
5. **Takes from 25 to 50% less explosives.**
6. In wet places it is difficult to blast because dry stemming is not available. Water does not affect the plug. It works as well in wet as in dry places.

MANUFACTURED IN

SHAMOKIN, PENNSYLVANIA, U. S. A.

BY

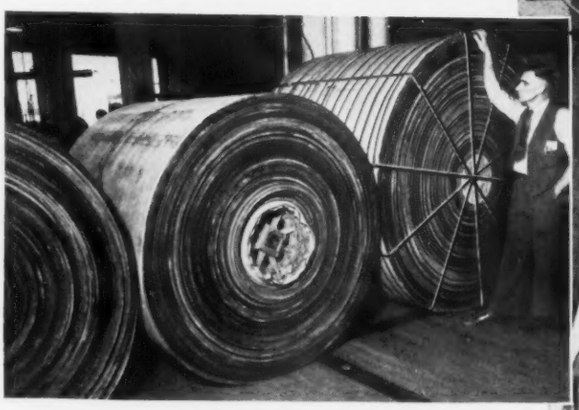
HEITZMAN SAFETY BLASTING PLUG CO.

Write for Samples. Give Size of Drill Hole

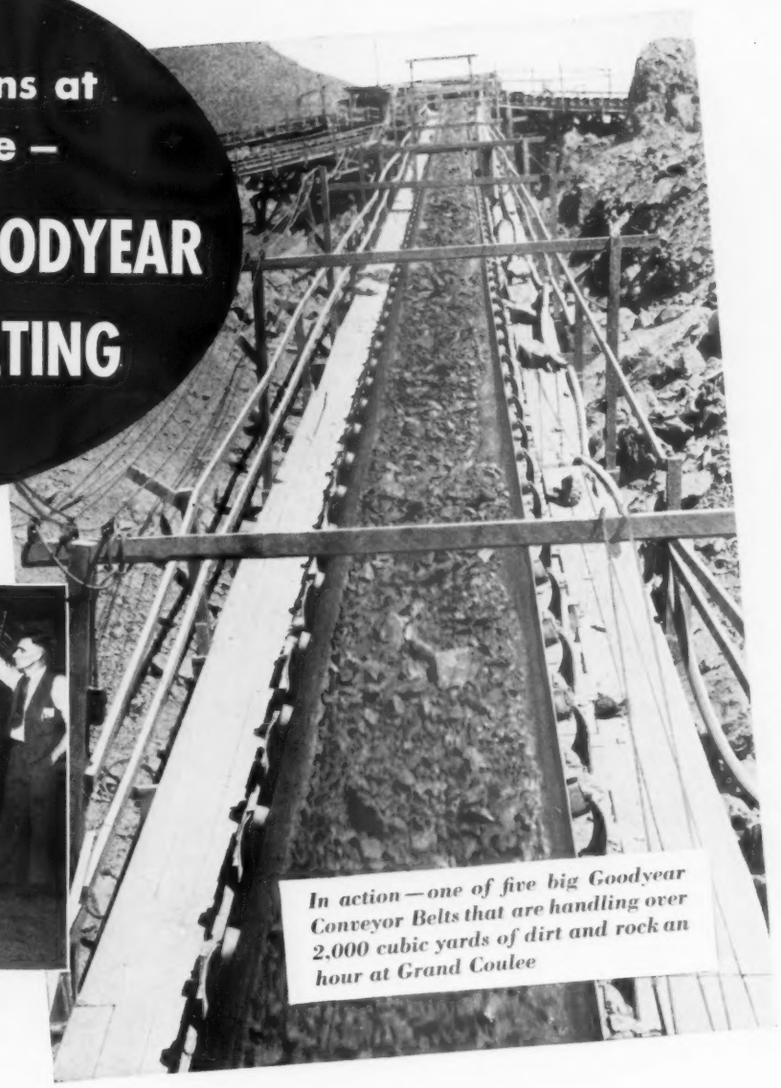
PRICE LIST WILL BE FURNISHED ON REQUEST

Moving Mountains at Grand Coulee —

ON 4 MILES OF GOODYEAR CONVEYOR BELTING



Man-sized! *Some of the huge Goodyear Conveyor Belts four to five feet wide now in service at Grand Coulee*



In action—one of five big Goodyear Conveyor Belts that are handling over 2,000 cubic yards of dirt and rock an hour at Grand Coulee

APPROXIMATELY four miles of Goodyear Conveyor Belting have been built and shipped to Grand Coulee Dam to help carry on this monumental construction work.

Goodyear Technical Men in the field and at headquarters cooperated with The Jeffrey Manufacturing Company in designing the huge belt conveyor system being used by the contractors in the building of this greatest of all dams. It is one of the largest conveyor systems ever built!

At Coulee Dam many Goodyear Mechanical Rubber Goods products other than belting are contributing importantly to the work. Goodyear Emerald Cord V-Belts are driving the conveyors. Goodyear Air Hose, Water Hose, Steam Hose and other products are all doing yeoman service in serving men and machines.

Wherever there is major construction work to do, you'll find Goodyear Conveyor Belts and other Mechanical Rubber Goods on the job—because experience has proved their high quality.

BELTS · MOLDED GOODS
HOSE · PACKING
MADE BY THE MAKERS OF GOODYEAR TIRES

THE GREATEST NAME IN RUBBER

GOODYEAR

Roebling...

The pacemaker in wire rope development

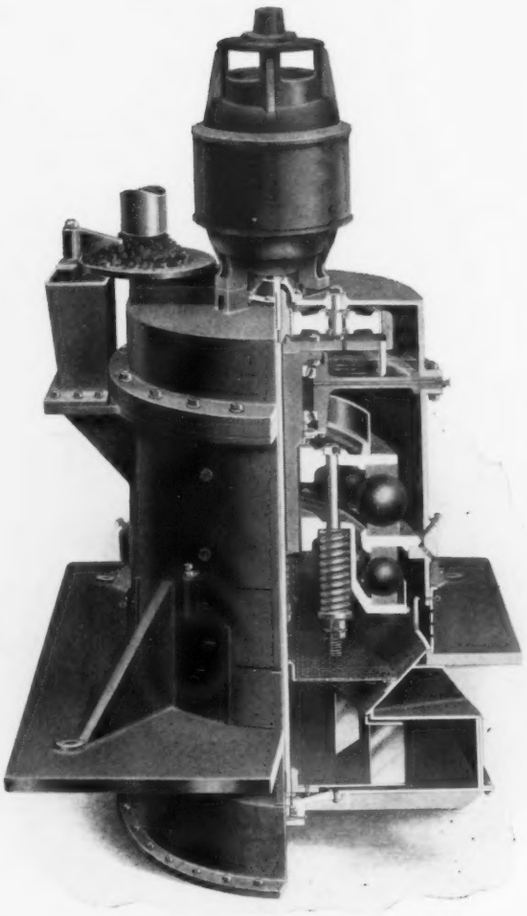
THE most exacting basis for judging wire rope performance is AVERAGE SERVICE.

This is the basis advocated by Roebling, in which rope cost per ton of material handled, or per other unit of service measurement, is based not on the service of a single rope but on the *average* service of several ropes.

John A. Roebling's Sons Co., Trenton New Jersey

NEW!

The Traylor-Collins Pulverizer Mill



A new product of an organization that has pioneered many money-saving machines in the rock products field over a period of thirty years and more.

The Traylor-Collins Pulverizer Mill will be found efficient and economical for the grinding of coal for many purposes, particularly for direct firing of kilns; for the lime industry; in the manufacture of ceramics, brick and clay products; in the fertilizer field; for the grinding of rock for many uses; and many other applications.

Operators interested in cost-cutting processes should closely investigate this new machine. Write to our office nearest you for our bulletin No. 1002.

TRAYLOR
ENGINEERING & MFG. CO.

Allentown, Pennsylvania

NEW YORK CITY, 2513 Empire State Bldg. — CHICAGO, 2151 One La Salle St. Bldg. — SALT LAKE CITY, 101 West Second South St.

LOS ANGELES, 919 Chester Williams Bldg. — SEATTLE, 6311 22nd Ave., N. E. — Timmins, Ontario, Canada, P. O. Box 113

MEXICO, Apartado 693 — MANILA MACH. & SUPPLY CO., Manila and Baguio, P. I. — Robins Conveyors (So. Africa) Inc., Johannesburg, Transvaal, S. A.

Export Department—104 Pearl St., New York City.

Foreign Sales Agencies: London, Lima, Sao Paulo, Rio de Janeiro, Buenos Aires, Santiago, Valparaiso, Antofagasta, Iquique, Oruro

European Works—Usines Carels Freres, Ghent, Belgium

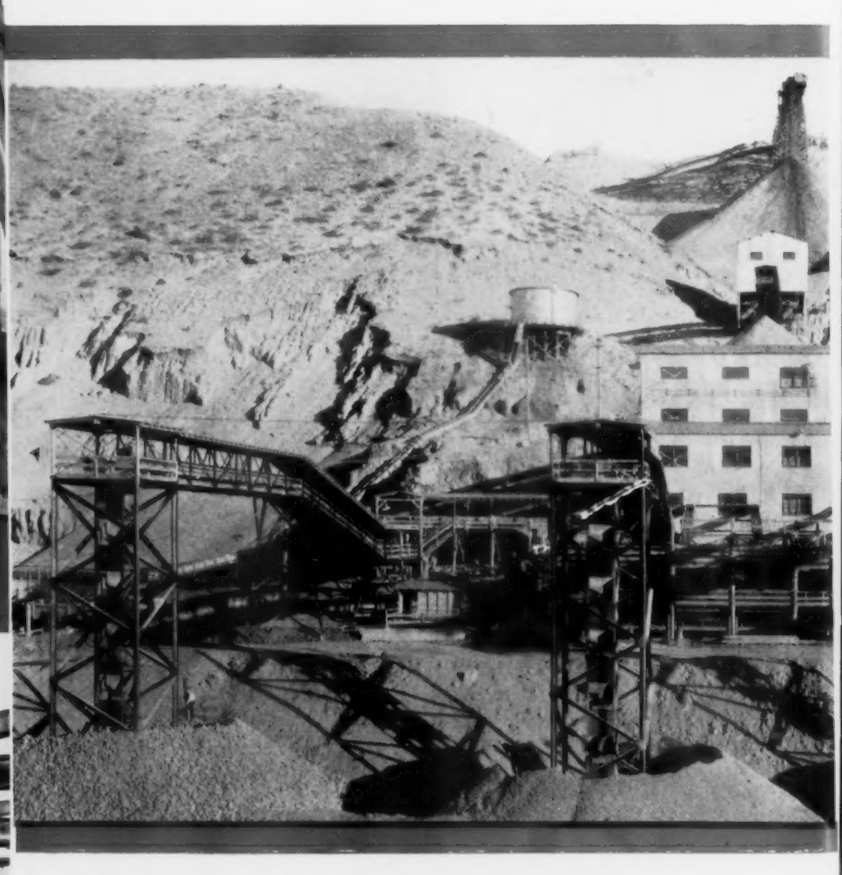
JEFFREY

Illustration above shows the Radial-Boom Excavating Conveyor, which is crawler mounted at shovel end . . . wheel and track mounted at the other. It follows the shovel . . . taking the raw aggregate to the Jeffrey Main Conveyor, which dumps it off the end of the trestle onto the raw stock pile.

In the design of the aggregate plant for Grand Coulee Dam . . . the Contractors and the Jeffrey Engineers . . . had to figure on equipment for supplying sand and gravel for a 12,000 cu.yds. per day concreting schedule. Equally as important as capacity were dependability and economy.

The success of the Jeffrey Muck Disposal System . . . pouring 40 to 50 thousand bank yards per day into Rattlesnake Gulch on the West Side . . . recommended Jeffrey Material Handling Equipment for the aggregate plant.

Two of the eight Jeffrey-Traylor Electric Vibrating Feeders . . . buried beneath the huge stock piles (see large picture) . . . they faithfully regulate the flow of material to the conveyor belts.



Two Jeffrey Sand Dewatering Drags are shown above. They speed up the process of separating the "fines" from the mucky "sand soup" and

The accompanying illustrations show some of the Jeffrey equipment which is being relied upon to bring a colossal project to a successful conclusion. Whether your plant is large or small . . . you want to insure maximum efficiency . . . our comprehensive service can be of help. Call on us.

THE JEFFREY

917-99 N. Fourth St. COLUMBUS, O.

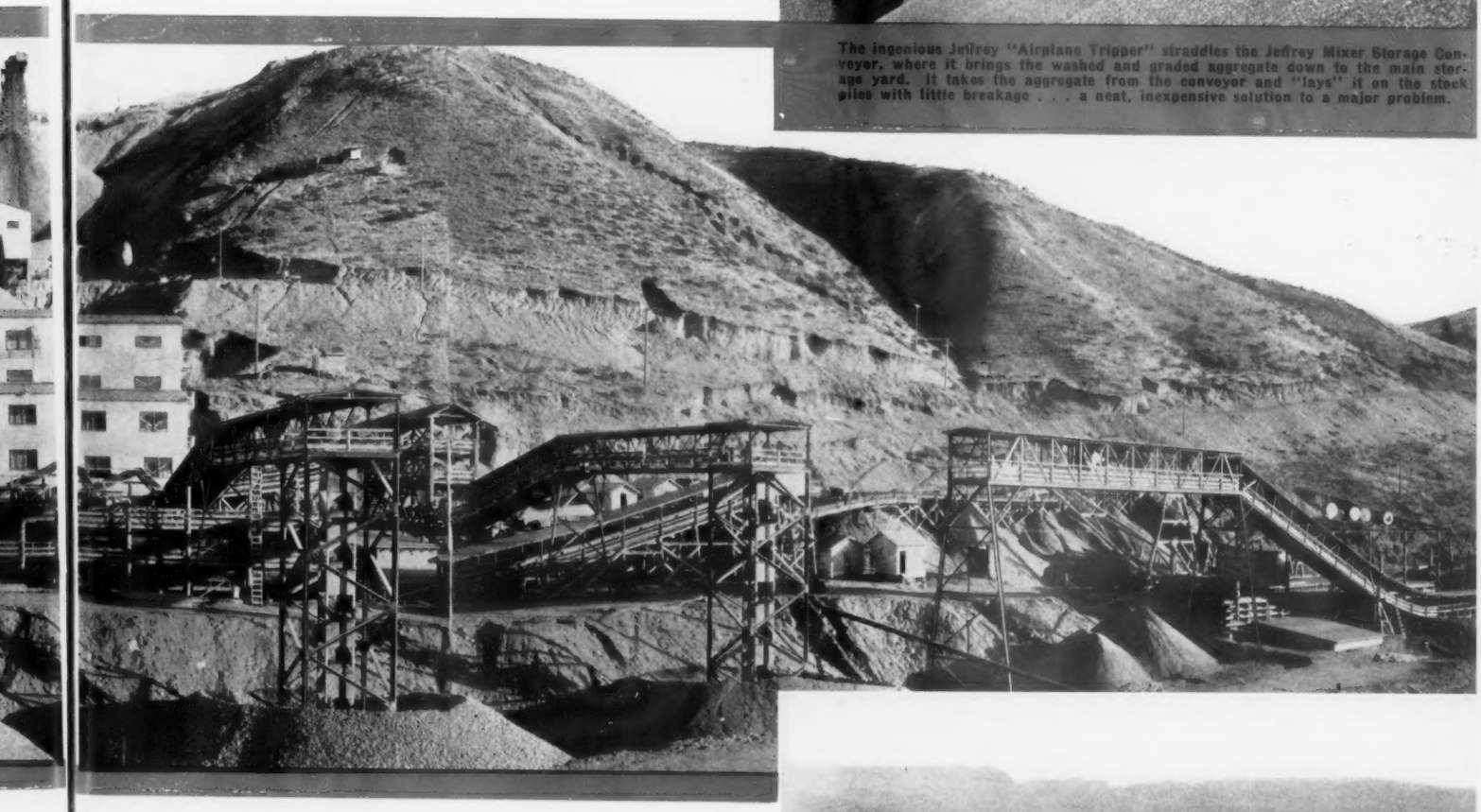
LOWERS HANDLING COSTS

AT WORLD'S LARGEST SAND AND GRAVEL PLANT

In addition to some 43 Conveyors, totaling about four miles . . . this equipment at Grand Coulee included 2 Radial-Boom Excavating Conveyors; 8 Electric Vibrating Feeders; 8 Sand Dewatering Drags; 2 Sand Blenders; 4 Small Trippers; an Airplane Tripper and a Waste Material Stacker.

Any or all of these Units can be applied to your condition . . . can similarly reduce your costs. Jeffrey Engineers stand ready . . . to work right in your office—in the field—to join with your engineers . . . to promptly solve the various material handling problems which confront you.

The ingenious Jeffrey "Airplane Tripper" straddles the Jeffrey Mixer Storage Conveyor, where it brings the washed and graded aggregate down to the main storage yard. It takes the aggregate from the conveyor and "lays" it on the stock piles with little breakage . . . a neat, inexpensive solution to a major problem.



The waste material . . . about 55% of that taken from the pit . . . is transferred to the disposal area over a Jeffrey Waste Material Stacker Conveyor Unit (above).

Jeffrey Equipment for the Nonmetallic Industry: Elevators, Conveyors; Revolving and Vibrating Screens; Feeders; Crushers; Pulverizers; Portable Loaders; Sand Settling Tanks; Chains; Sprockets; Locomotives . . . a complete line of Sand and Gravel Handling Machinery.

MFG. CO.

Sales Offices in Principal Cities

for 1936 — the P&H PACEMAKERS

With P & H Ward Leonard Control

One of the two P & H Model 1200 machines that opened the quarry for the World's Largest Cement Mill at Brodhead, Pa. (National Portland Cement Co.)

Harnischfeger *Sets the Pace* Again

● They're the biggest of the new P & H Pacemakers—these new type Ward Leonard electric shovels—the first true one-man machines. Every operation in digging, travel, and turning is fully controlled by one operator.

They're true Pacemakers—setting a pace fully 15% faster. In these machines, as in other new P & H Pacemakers, greater strength with lower weight has been made possible through the extensive use of High Tensile Alloy steels and P & H-Welded construction. Lighter, stronger front-end equipment, far less counterweight, and complete rebalance of all machine units cuts out all excess weight, reduces inertia, makes possible faster swing and hoist speeds and more rapid crowding.

And there's more power in the new Ward Leonards, just as there is in the other new Pacemakers—more power and more efficient transmission of power—to make this the biggest producer of its size ever built.

Write today for full information on these new electric machines or on any of the smaller models listed at the left.

PACEMAKING PERFORMANCE IN EVERY SIZE

Regardless of the size or type of machine you're after, there's a P & H Pacemaker built to break records for production and low cost. Here are the 1936 Pacemakers. Ask for further information on the Model that meets your needs.

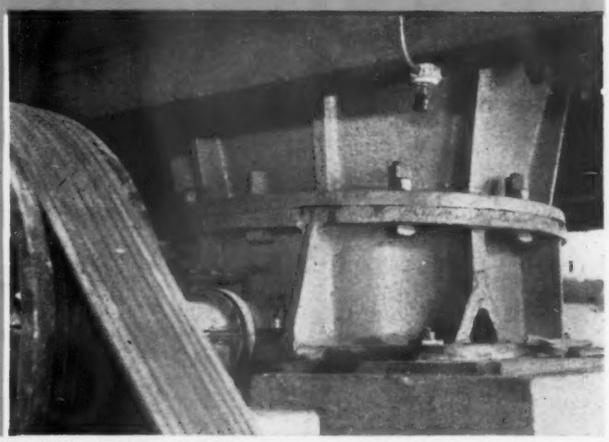
Model 100—⅜ yard
Model 150—½ yard
Model 300B—⅝ yard
Model 350—¾ yard
Model 450—1 yard
Model 500—1 yard
Model 600A—1 yard
Model 650—1¼ yards
Model 575—1¼-2 yards
Model 705—1½ yards
Model 765—2 yards
Model 780—2 yards
Model 800A—2½ yards
Model 810—2¾ yards
Model 850—2½-3 yards
Model 900—3½ yards
Model 900A—3½-4 yards
Model 1200—2 yards (P & H Ward Leonard)
Model 1250—2½ yards (P & H Ward Leonard)
Model 1300—3 yards (P & H Ward Leonard)
Model 1400—4 yards (P & H Ward Leonard)

HARNISCHFEGER CORPORATION
4451 W. NATIONAL AVE. *Established 1884* MILWAUKEE, WIS.

Warehouses and Service Stations: Hoboken — Memphis — Jacksonville — Seattle — Dallas Los Angeles — San Francisco

FASTER IN THE FIELD

TELSMITH AT THE GRAND COULEE DAM



A No. 20 TELSMITH PRIMARY BREAKER CRUSHES ALL THE ROCK FOR THIS BIG PROJECT

Why was the Telsmith Primary Breaker selected by the M-W-A-K Co. for the million dollar aggregate plant at the Grand Coulee Dam? Why was the entire responsibility for crushing all oversize from the Brett pit, 20 inch to 6 inch boulders, placed on Telsmith?

Because Telsmith never fails . . . it is *the* outstanding performer on hard rock. It has a fixed shaft and sleeve eccentric. Short and compact, it has a *steel* frame and *steel* crown. Force feed oiling permits higher eccentric speeds and faster gyration. Larger head and concave diameters, with greater receiving and crushing area, allow faster feeding. Telsmith's *parallel pinch* starts immediately . . . stops slippage . . . crushes full tilt all the way down . . . *guarantees bigger capacity.* Investigate Telsmith's guarantee against breakage, even by tramp iron. Write for Bulletin C-15.

BC-1-36

SMITH ENGINEERING WORKS, 504 EAST CAPITOL DRIVE, MILWAUKEE, WIS.

50 Church Street, New York City • 201 No. Wells St., Chicago, Ill. • 1013 Commercial Trust Bldg., Philadelphia, Pa.
605 Statler Bldg., Boston, Mass. • 412 Westinghouse Bldg., Pittsburgh, Pa. • Brandeis M. & S. Co., Louisville, Ky.
Associates in Canada: Canadian Ingersoll-Rand Co., Ltd. Montreal, Toronto, Winnipeg, Vancouver.

TELSMITH

He TIMED *his* FUSE *for* 100 YEARS

A century has passed since Wm. Bickford discovered that a simple twist of jute yarn could be made to hold a core of gun powder in a continuous, slow-burning train.

In this discovery he bridged a hundred years—perhaps an age, for during the century that has witnessed the greatest progress the world has ever known, this basic principle has remained unchanged.

Bickford Safety Fuse came to America in 1836. At first a crude, handmade product, its development throughout the years has been evidenced by closer standards, better materials, finer construction. Steady improvement rather than radical change bears witness to able thinking, careful planning one hundred years ago.

In 1936 we celebrate our Centennial—and dedicate ourselves to maintain these high standards, that Ensign-Bickford Safety Fuse may ever be dependable.

A product, like a person, is known by the company it keeps. During this year we shall show you the use of Ensign-Bickford Safety Fuse and Cordeau-Bickford Detonating Fuse by famous companies.

Beginning a
1836
1936
NEW CENTURY

ENSIGN-
BICKFORD
Safety Fuse

CORDEAU-
BICKFORD
Detonating Fuse

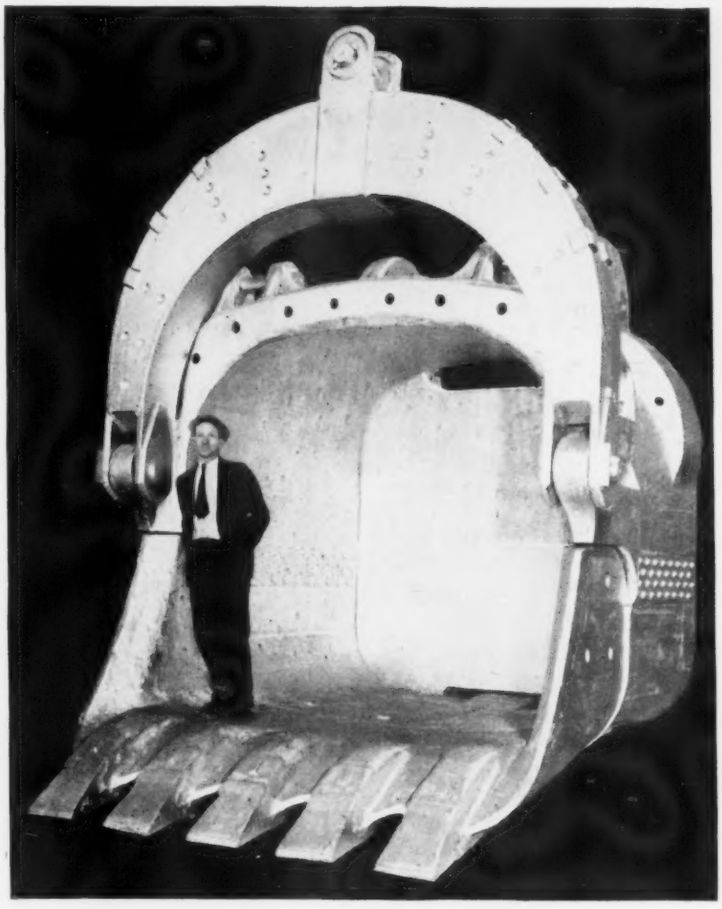
Simsbury, Connecticut, U. S. A.

SF-50

THE ENSIGN-BICKFORD COMPANY

Now Available

from ½ yard to 18 yard



AMSCO Renewable Lip Dippers!

AMSCO Renewable Lip Dippers (U.S. Patent No. 1,945,064) are now available in all sizes from ½ yard to 18 yards. To all sizes, from the smallest to the largest, accrue the same profit making values — *faster filling* and *quicker dumping*. Because of the correct placement of the teeth at the lip corners, the thin cutter edge lips, the smooth body interior and the correct body taper their use insures increased yardage.

Over 600 AMSCO Renewable Lip Dippers are in use today on every type of digging job, an excellent testimonial to the rapid acceptance by shovel users of these new, improved design dippers.

Operating features of AMSCO Renewable Lip Dippers include quick and easy change of the digging lips in the field by simply knocking out four keys and loosening two U-bolts, a range of lips to suit every digging requirement and the back lug arrangement to fit the dipper stick of every make of shovel.

See the Amsco Exhibit at the Road Show!

600 users can't be wrong — get the details on AMSCO Renewable Lip Dippers from your shovel maker or at our Booth at the Road Show.

AMERICAN MANGANESE STEEL COMPANY

Division of American Brake Shoe & Foundry Company

396 East 14th Street, Chicago Heights, Ill.

Foundries at Chicago Heights, Ill.; New Castle, Del.; Denver, Colo.; Oakland, Calif.; Los Angeles, Calif. Offices in Principal Cities

AMSCO

TRADE MARK REGISTERED

DUST CONTROL....*Suppression*

...Collection...Disposal

BE YOUR DUST PROBLEM SMALL OR LARGE, IF IT INVOLVES TEMPERATURE CONSIDERATIONS OR REQUIRES *Wet* or *Dry* TREATMENT

Consult **BLAW-KNOX**

for a prompt economical solution

BLAW-KNOX

BLAW-KNOX COMPANY

2080 FARMERS BANK BUILDING PITTSBURGH, PA.

Offices in Principal Cities

1936 JANUARY 1936

SUN	MON	TUES	WED	THUR	FRI	SAT
Let's go! Everybody off to a flying start on the New Year			1	2		4
5		7	8	OPEN HOUSE AT "AMERICAN HOIST" HEADQUARTERS— AT ROAD SHOW— —SAVE THE DATE		11
12	13		15	16	17	
19	ROAD SHOW STARTS		22	23	ROAD SHOW CLOSES	25
26	27	28	ORDER YOUR NEW "AMERICAN" NOW		31	

THE AMERICAN GOPHER

AMERICAN HOIST & DERRICK COMPANY
SAINT PAUL, MINNESOTA

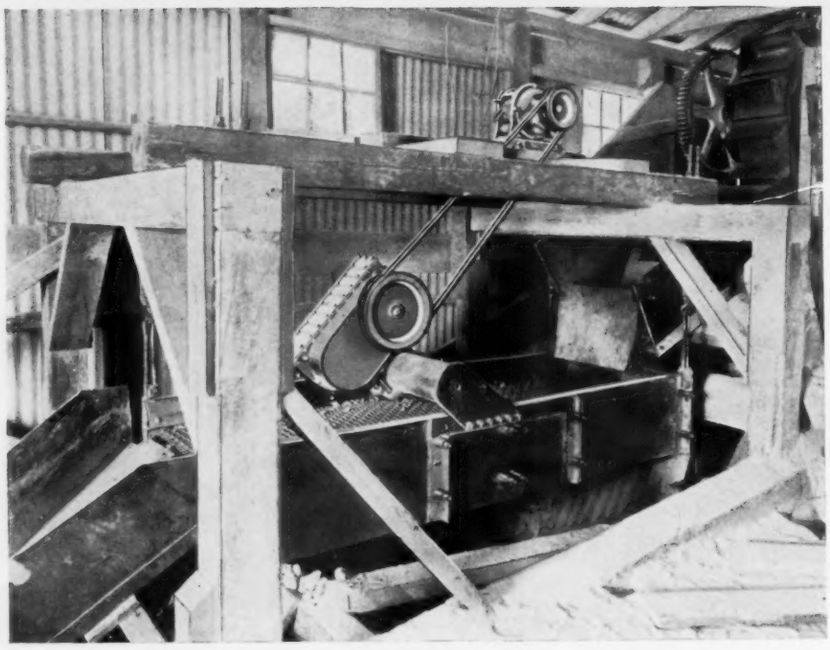
AMERICAN SINCE 1905 GOPHER SHOVELS

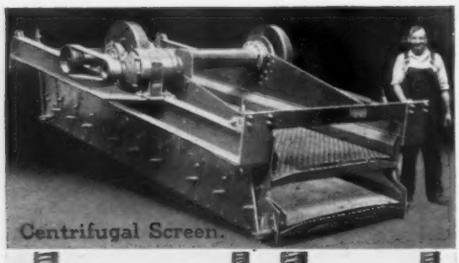
AMERICAN gopher SHOVELS

CRANES · DRAGLINES

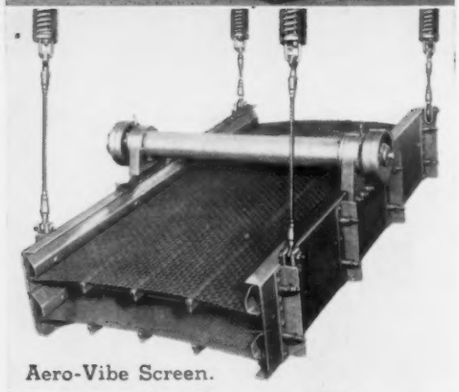
3 Types

Which do You Need *for* Your Screening?

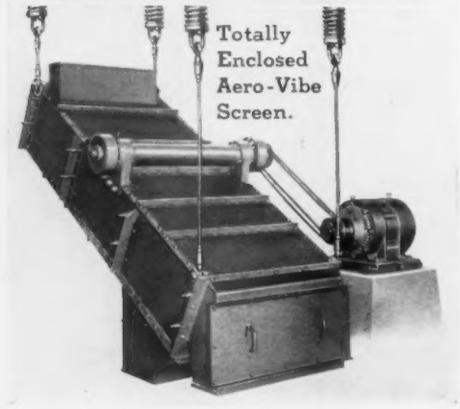




Centrifugal Screen.



Aero-Vibe Screen.



Totally Enclosed Aero-Vibe Screen.

● Allis-Chalmers has now developed a third major type of screen, the LOW-HEAD Horizontal type. This screen, which is illustrated above was designed primarily to meet the demand for a vibrating unit for plants where there was little head room. It is installed in a horizontal plane, not inclined like most screens. Vibration is imparted to screening surfaces in such a way that the material on the screen is continuously thrown forward. This LOW-HEAD screen supplements the AERO-VIBE and CENTRIFUGAL types.

● AERO-VIBE screens have a rapid, adjustable vibrating motion produced by counterweighted wheels mounted on the drive shaft. They were developed for medium to fine size material and for rather limited tonnages.

● For heavy loads and maximum range of sizing, engineers recommend the CENTRIFUGAL type screen. Its screening action is positive and equally intense for all tonnages, being transmitted to the screen body or vibrating member by an eccentric shaft.

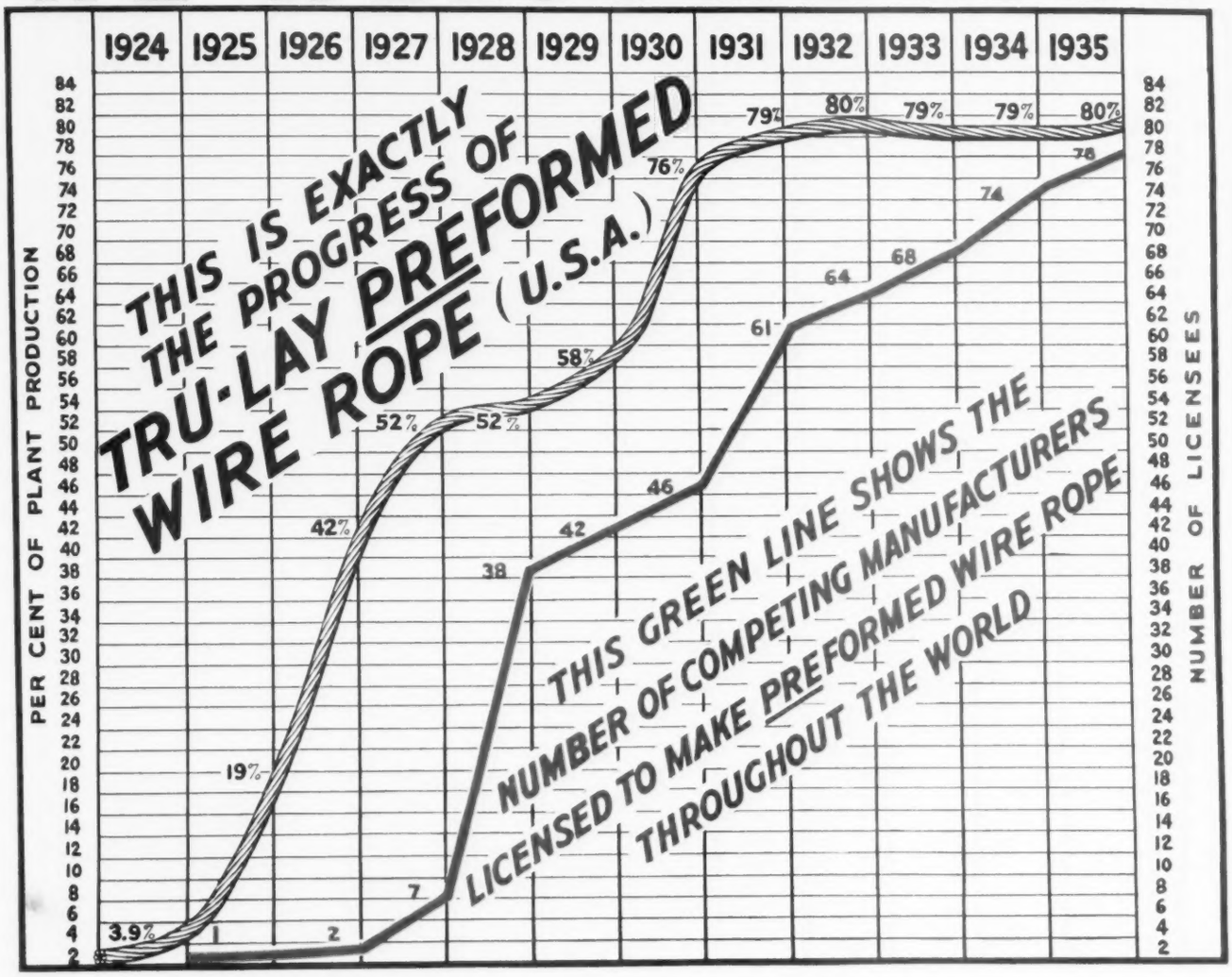
● Most Allis-Chalmers vibrating screens are suspended from the building structure by cables and springs. This method of installation confines the vibration or screening motion to the body and material on the screen deck, gives a better screening action and lowers installation cost.

● Allis-Chalmers engineers will be glad to recommend the type of screen best suited to your conditions. Write the nearest district office or the main plant at Milwaukee.

ALLIS-CHALMERS

Allis-Chalmers Manufacturing Company, Milwaukee, Wisconsin, U.S.A.

WE WELCOME 1936



We started making TRU-LAY Preformed Wire Rope in 1924. It was a better rope than had ever been made before. But we had to meet the competition of fixed buying habits; long established standards for wire rope service; the inborn prejudice against anything radically new.

But TRU-LAY Preformed proved itself such a superior rope that today the manufacturers responsible for over 95% of the wire rope production in the United States are licensees under our exclusive preforming patents. They too, *now,* make and sell preformed wire rope. And *that* is new competition for us. Tougher competition. By licensing them we have admitted our keenest competition to our own exclusive field of action.

But we are glad for this new, and tougher, competition. *First:* it is the most convincing acknowledgment of the superiority of preformed wire rope. *Second:* it adds momentum to the swing toward preformed. *Third:* it keeps us on our toes to see that production and service are maintained at the highest standard on our own TRU-LAY Preformed. . . . For—with this new and licensed competition, we've *got* to make TRU-LAY Preformed the best rope of all.

We welcome 1936 . . . the year in which we will prove our "metal" to wire rope users—the quality of our product and the efficiency of our Engineering and Production Departments which the entire industry throughout the world has acknowledged.

AMERICAN CABLE COMPANY, Inc., WILKES-BARRE, PA.

An Associate Company of American Chain Co., Inc.

In Business for Your Safety

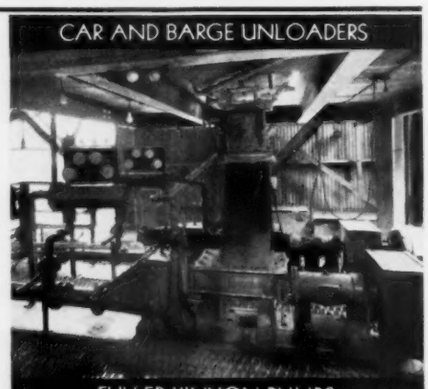
Branches or Distributors in all Principal Cities

GREEN SIGNIFIES SAFETY

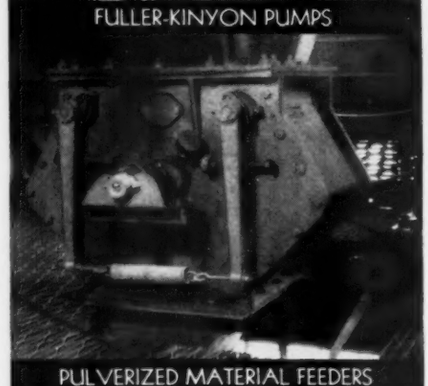
TRU-LAY *Preformed* Wire Rope

★ ALL AMERICAN CABLE COMPANY ROPES MADE OF IMPROVED PLOW STEEL ARE IDENTIFIED BY THE EMERALD STRAND

FULLER EQUIPMENT *for* PLANT MODERNIZATION



CAR AND BARGE UNLOADERS



FULLER-KINYON PUMPS

PULVERIZED MATERIAL FEEDERS

COMPRESSORS AND VACUUM PUMPS

AIRVEYOR PNEUMATIC CONVEYORS

FULLER COMPANY, pioneers in conveying pulverized materials through pipe lines, has developed, through close co-operation and study, a complete line of equipment for feeding and transporting pulverized, granular, and crushed materials . . . equipment that will, in many ways, assist you in modernizing your old plant, or, if you contemplate building a new plant, give you the most modern conveying systems obtainable.

The engineering staff of this company is constantly making studies of plant conditions, and is pleased to pass on the knowledge thus gained to its customers in the way of better engineering and efficient equipment.

With complete confidence, we offer the following equipment:—

FULLER-KINYON PUMPS, stationary and portable—These pumps offer unusual economies in transporting pulverized materials, and permit freedom in plant layout and location, such as cannot be secured by any other system. They are standard practice in the cement industry and are handling over thirty other materials.

FULLER ROTARY FEEDER—A feeder of consistent, volumetric accuracy . . . no flooding, pulsations, spinning, clogging, or metal-to-metal contacts. It is ideal for delivering preliminary feed and air separator tailings to tube mills, for feeding cement kilns, and for measuring and proportioning raw materials.

FULLER COMPRESSORS AND VACUUM PUMPS, single and two-stage—Compactness, light weight, and smoothness of operation are a few of the many advantages this type of compressor has to offer. They are available for pressures up to 125 lbs. and vacuums of 29.75", capacities of 20 to 1800 CFM.

THE AIRVEYOR—A pneumatic conveyor for fine, crushed, and granular materials, built in two types, Receiver type for granular and crushed materials carrying relatively little dust, and the Filter type, which handles dusty materials with absolute cleanliness. Each type may be applied in a wide variety of arrangements to meet specific problems. They are built in both stationary and portable or traveling types.

FLUXO PUMP—For conveying pulverized materials; especially adapted for long pumping distances.

Fuller Company
CATASAUQUA, PENNA., U. S. A.

Chicago: 1118 Marquette Bldg. San Francisco: 564 Market Street

G-2-A

REPUBLIC

Announces

a New TOWER

PNEUMATIC HOSE

★ Through field experience and extensive laboratory research, Republic has now developed a new air hose that successfully combats the destructive influences of oil, heat, high pressures and the severe abrasive action of sharp rock and coal. It is built for most rugged use in mines, quarries, rock industries, construction and general industrial applications.

The tube has the utmost resistance to oil and heat, being made of a special compound similar to that used in oil conducting hose. The braided plies are composed of specially twisted cords, which give strength without impairing flexibility. The cover is designed for extreme wear and exposure to sun and weather. It is made from an unusually high-grade compound that has great resistance to abrasion, cutting action, shock and abuse.

All construction details of the new Tower Hose have been so balanced and engineered as to result in a hose of great strength without excess bulk or useless weight.

THE REPUBLIC RUBBER CO. «» YOUNGSTOWN, OHIO

MECHANICAL RUBBER PRODUCTS FOR EVERY INDUSTRIAL REQUIREMENT

ORDER REPUBLIC RUBBER PRODUCTS FROM YOUR DISTRIBUTOR

"Williamsport Form-Set" Wire Rope

The Perfect *Pre*formed Wire Rope

Made with tough, fatigue resisting wire, with the most minute accuracy, the most careful fabricating plus precision *Pre*-forming.

If you have already found that *Pre*-formed Wire Rope serves your installation better, then "Form-Set," Williamsport's method of *pre*forming, will make you happier in its use.

Write us for particulars and prices.

WILLIAMSPORT PURPLE STRAND

WILLIAMSPORT WIRE ROPE CO.

Main Office and Works: Williamsport, Penna.

Branch Sales Offices: 122 S. Michigan Ave., Chicago

THEW and UNIVERSAL present 5 NEW LORAINS★

★ In presenting these five new Lorains for 1936, Thew and Universal express their confidence in the future of the Construction Industry.

In building these five new Lorains to the tried, tested and proved Center Drive design—and in refining and greatly improving all Lorain models—Thew and Universal again express their confidence in the continued ability of all Center Drive units to move more dirt, faster and at lower costs . . . a fact well proved by Lorain field performance.

2-YARD LORAIN-87

New from crawler treads to boom tip—a Center Drive, convertible unit with the newest development in shovel booms since the shipper shaft boom.

BIG DRAG LORAIN-95

Specially designed—and Center Drive built—for big capacity, long range, dragline, clamshell or crane service—mounted on a crawler 18 ft. long.

1-YARD LORAIN-55D

A heavy-duty 1-yd. shovel—full 15-ton crane capacity—with longer boom, longer, heavier, crawler; Diesel powered for increased output, lower fuel cost.

3/4-YARD LORAIN-40 Truck Shovel

L-40 minimum weight and balanced design now permits offering you 3/4-yd. shovel output and earnings combined with motor truck mobility.

3/8-YARD LORAIN-27

A 3/8-yd. full-revolving unit, built to a standard of quality equal to or better than that of any excavator, regardless of size or price—with special trailer

5 New Models.. plus these other improved LORAINS

LORAIN · 77
1½-yd. shovel—20-ton crane—Diesel powered

LORAIN · 75D
1¼-yd. shovel—18-ton crane—Diesel powered

LORAIN · 45
Heavy-duty ¾-yd. shovel—Diesel powered

LORAIN · 40
¾-yd. Capacity, Strength, Power; ½-yd. Weight

LORAIN · 37
⅝-yd. Shovel, Crane, Clam, Drag

LORAIN · 30
½-yd. Shovel—with special trailer

THE THEW SHOVEL CO., LORAIN, O.
THE UNIVERSAL CRANE CO., LORAIN, O.

THEW CENTER DRIVE

AGGREGATE PRODUCERS!

STABILIZE YOUR BUSINESS WITH STABILIZED MIX

Your Greatest Opportunity in Years!

ROAD officials agree that stabilized mix is the answer to the gravel and stone road problem. Commercial production is the only means by which cities and counties can take immediate and extensive advantage of this advanced method of road building. It provides a dustless, hard surface year-round highway, and costs but little more than loose, dusty gravel.

Utilizes Your Waste Material

The success of this advanced method of road building lies in the fact that mixtures of aggregates, binder-soils and calcium chloride, properly proportioned, form a durable, stable, high type road. The mixtures can be made up largely of the finer aggregates and, in many cases, utilize soils and clays which form the overburden in pits and quarries and which ordinarily have to be moved away at considerable expense.

Most of the Work Can be Done in Slow Times

In plant-mix soil stabilization, you not only utilize materials often classed as waste, but you can also utilize waste man power and equipment time. You simply stock pile your finer materials, which have been tested, and when orders come, mix them with calcium chloride and the soil fractions needed to complete the proper mixture.

Gravel Pits, Quarries, Slag Producers Can All Supply This New Material

Soil stabilization formulae are available for the use of gravel, slag and stone. Each type of aggregate may be blended with other necessary soil factors to secure proper results. Much of the needed equipment is already in use in the handling of aggregates. Additional needed equipment is not costly. The market is tremendous, growing at a rapid rate. Aggregate producers who have entered this field are busy and enthusiastic.

Write today for full information on stabilized mix for highways, driveways and other areas requiring dustless all-weather surfacing. Specifications and detailed instructions for plant mixing at pit or quarry are available on request. Get started at once and get the business coming from the proposed extensive mileage of secondary roads to be built in 1936.

CALCIUM CHLORIDE ASSOCIATION

THE COLUMBIA ALKALI CORPORATION
Barberton, Ohio

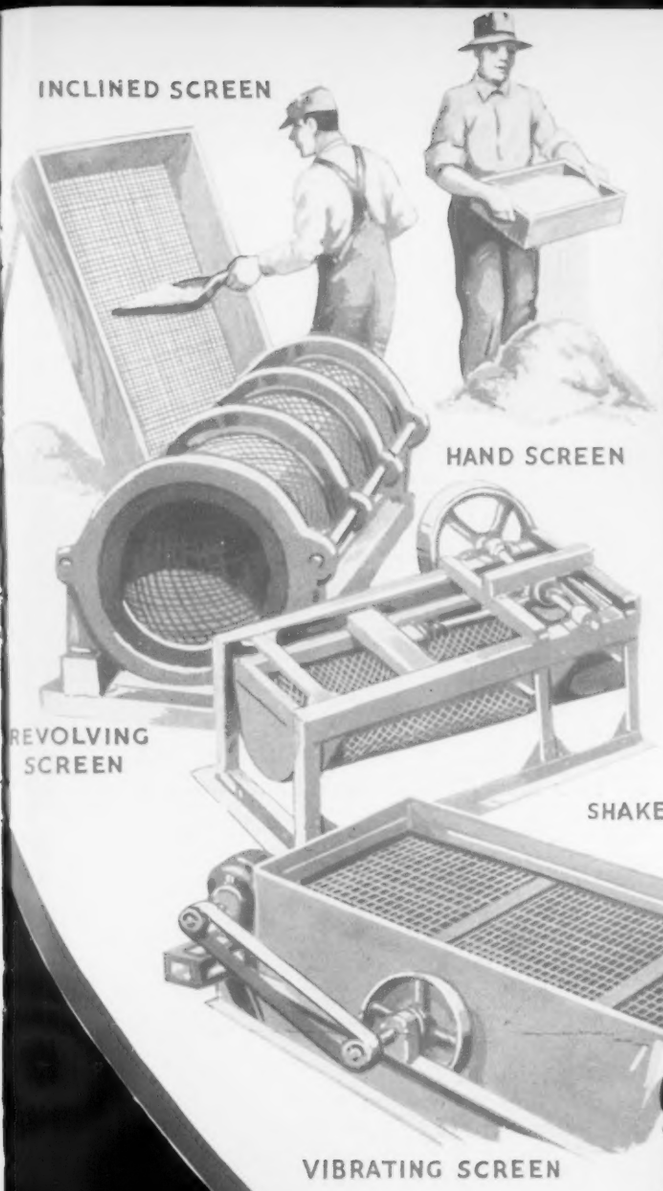
THE DOW CHEMICAL COMPANY
Midland, Michigan

MICHIGAN ALKALI COMPANY
60 E. 42nd St., New York City

SOLVAY SALES CORPORATION
61 Broadway, New York City

CALCIUM CHLORIDE

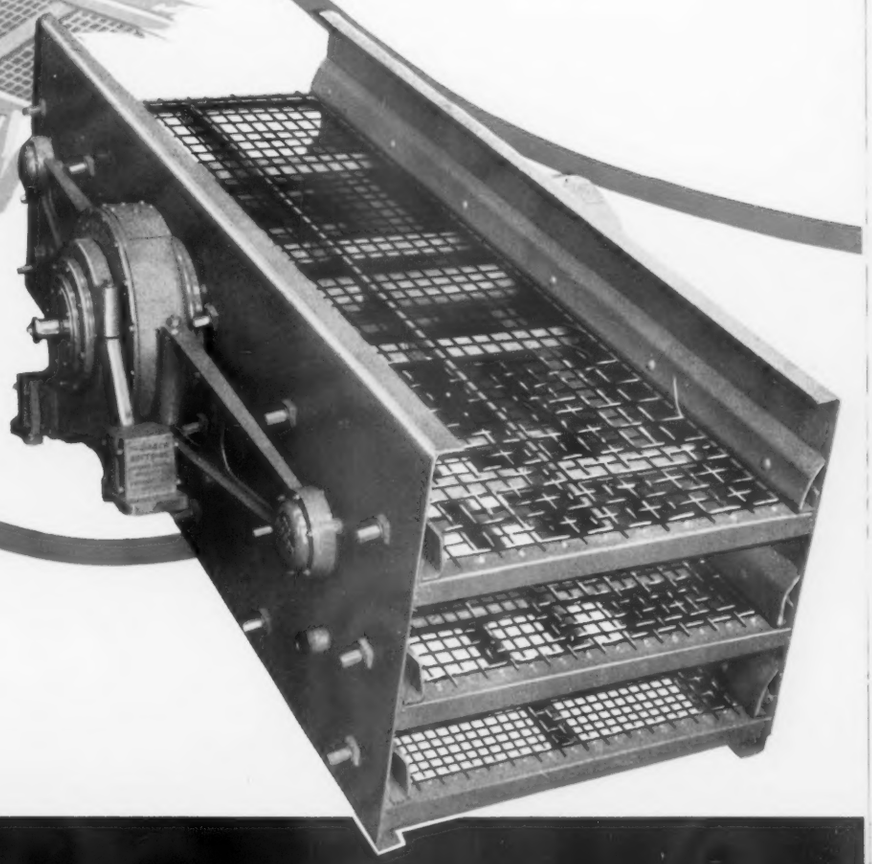
FOR STABILIZING ROAD SURFACES



THE MARCH OF

PROGRESS SCREENING

It's a long step from the hand screens of years ago to the SELECTRO vibrating screen. The SELECTRO represents the highest point of developments in vibrating screens. It is built by engineers who do nothing but manufacture vibrating screens—whose designs are years ahead of any others.



DEMAND THESE FEATURES WHEN BUYING SCREENS

- Oil, Not Grease Lubrication (easy to start in winter).
- Variable Throw (easily adjusted to suit any change in material).
- Extra Heavy Duty Construction (frame, bearings, and all parts can stand the toughest jobs with ease).
- Full Circle Throw (the most accurate gradation with 100% screening efficiency).
- Eleven other distinct features (without which no vibrating screen can be considered modern) — ask about them.

Also a Junior Model from 18 to 30 inches in width and 48 to 96 inches in length.

PRODUCTIVE EQUIPMENT CORP.

210 E. Ohio Street Chicago, Ill.

LE TOURNEAU 12-Yard CARRYALLS rolling in tandem behind a 75 HP tractor

Use LE TOURNEAU EQUIPMENT

for Faster and Cheaper Moving of Materials

LE TOURNEAU BULLDOZER working in an open coal pit in southern Illinois

LE TOURNEAU CRANE with 30-foot boom placing timbers for a ramp which is to be used for loading LE TOURNEAU BUGGIES by means of a CARRY-ALL SCRAPER

CARRYALL SCRAPERS for stripping, hauling, dumping, cut and fill work. The LE TOURNEAU CARRYALL moves big loads with ease because it rolls on heavy-duty roller bearings and large pneumatic tires. Made in 12, 8 and 6-yard sizes for use with 40 to 90 HP tractors.

BULLDOZERS and ANGLEDOZERS with correctly-curved bowl, built to dig, making down pressure unnecessary; with fast, high, powerful lift and low drop; of light, yet stout and rigid construction; made for all size tractors, from 40 HP up. ANGLEDOZERS with simple angling adjustment—rigid in all positions.

Tractor CRANES in three-boom lengths—20, 30 and 40-foot—for loading and unloading equipment and materials; placing machinery; moving trackage; lifting heavy parts when making repairs and a multitude of other tasks. Made for use with tractors from 20 to 95 HP. Can be quickly coupled or uncoupled from tractor, making the latter available for other uses.

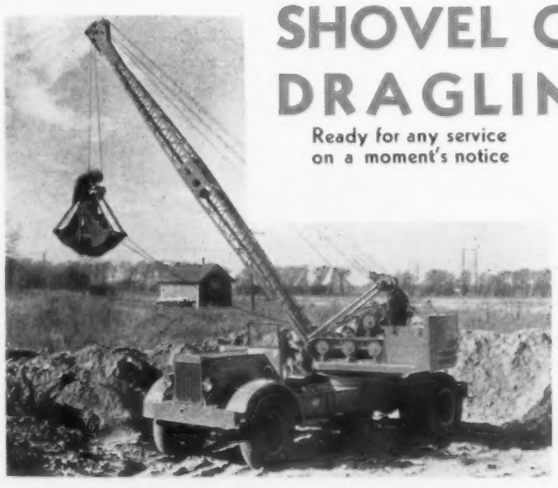
All LE TOURNEAU equipment is operated by cable control from a POWER CONTROL UNIT mounted at the rear of the tractor. This control is trigger-quick, positive and accurate in action. Weather does not affect its efficiency.

Write, describing your material-handling problems, and our Engineering Department will gladly tell you what LE TOURNEAU equipment can do for you. R. G. LE TOURNEAU INC., Peoria, Illinois, Stockton, California, Cable Address: "Bobletorno."

Manufacturers of: ANGLEDOZERS, BULLDOZERS, BUGGIES, CARRYALL SCRAPERS, CRANES, ROOTERS, SHEEP'S FOOT ROLLERS, POWER CONTROL UNITS.

LE TOURNEAU

SWING INTO 1936 with the New MICHIGAN



SHOVEL OR DRAGLINE

Ready for any service on a moment's notice

MICHIGAN FEATURES

True Finger-Tip Clutch Control.
Speedy Operation assures Extra Capacity on any Job.
High-speed Air-controlled Shovel Mechanism with Ball Bearing Top and Hook Rollers.
Wide Range of Application for use in connection with Portable Plants.

The Michigan for Mobility

With the widespread use of portable plants, there comes a universal demand for a modern power shovel unit that is quick to move from place to place, and easy to maneuver on the job for any kind of material handling service. The new MICHIGAN Model T-6 Truck Shovel meets these requirements, because it is especially designed for the purpose. Its performance in the field marks it as America's finest completely mobile shovel unit.

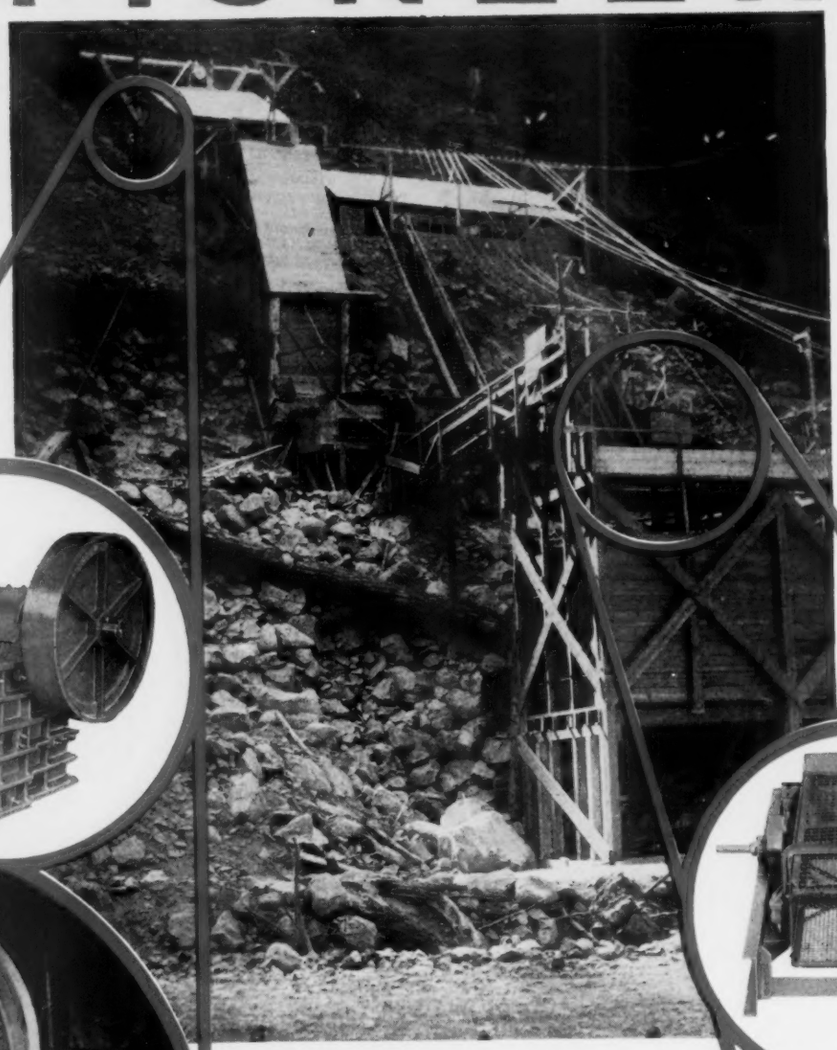
Ruggedly built and efficiently mounted on an air-tired truck body, with a super-power unit and finger-tip control, the MICHIGAN will follow your motor truck anywhere and do anything—loading trucks from stock piles, unloading cars, digging or re-handling material. It is readily convertible—simply by changing the boom—into crane, dragline, clamshell, trench hoe, backfiller or skimmer. The MICHIGAN is the "last word" in truck shovel design, and the *first choice* of progressive operators, who are after greater profits in 1936. *Write for new Michigan folder.*

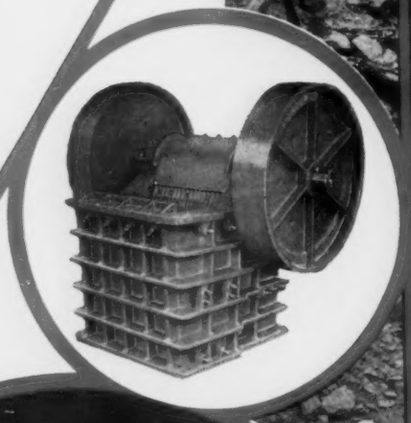
MICHIGAN POWER SHOVEL COMPANY
BENTON HARBOR, MICH.

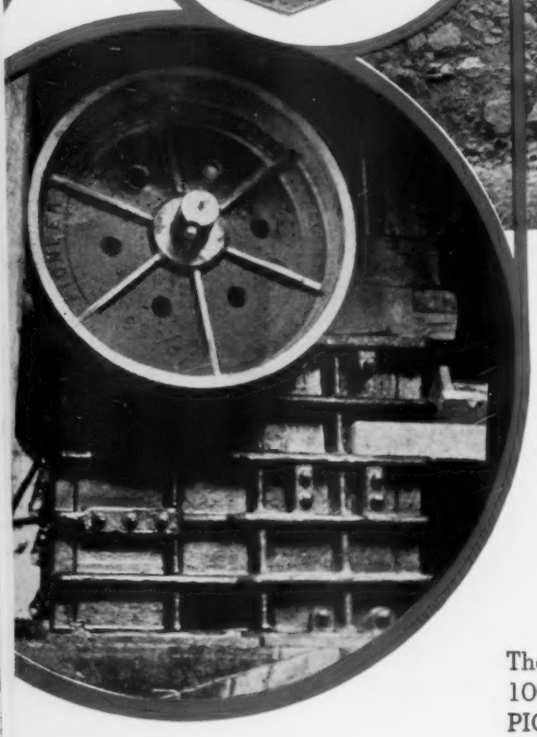
PIONEER

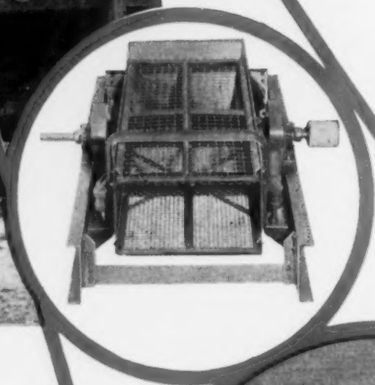
2436 JAW CRUSHER

New developments in metals makes it possible to build this big capacity crusher rugged enough to stand the gaff, yet light enough to be portable.









VIBRATOR SCREEN

Pioneer Vibrator Screens are designed and built to give big capacities at low operating and maintenance costs.

Selected by

THEO. ARENZ

PORTLAND, ORE.

for this

100-tons-per-hour Crushing Plant

The primary crusher in a plant designed to produce 100 tons per hour must be a real crusher. The PIONEER 24x36 jaw crusher has proved itself to be ***just that,*** not only in Oregon but all over the country. And the Pioneer Vibrator Screen is a good teammate for any crusher.

Perhaps you have a crushing problem ahead of you, too. The modern, efficient plant illustrated above may not fit your needs at all. But Pioneer, with a quarter of a century of experience in its line, can help you. Crushing, screening and handling rock and gravel is our specialty. Get in touch with us or consult any of our distributors.

Send for FREE Literature

- ☐ JAW CRUSHERS
- ☐ ROLL CRUSHERS
- ☐ VIBRATING SCREENS
- ☐ HORIZONTAL SCREENS
- ☐ REVOLVING SCREENS
- ☐ CONVEYORS
- ☐ PORTABLE WASHING PLANTS

PIONEER GRAVEL EQUIPMENT MFG. CO.

1515 CENTRAL AVENUE NORTHEAST

MINNEAPOLIS, MINN.

Selfvulc

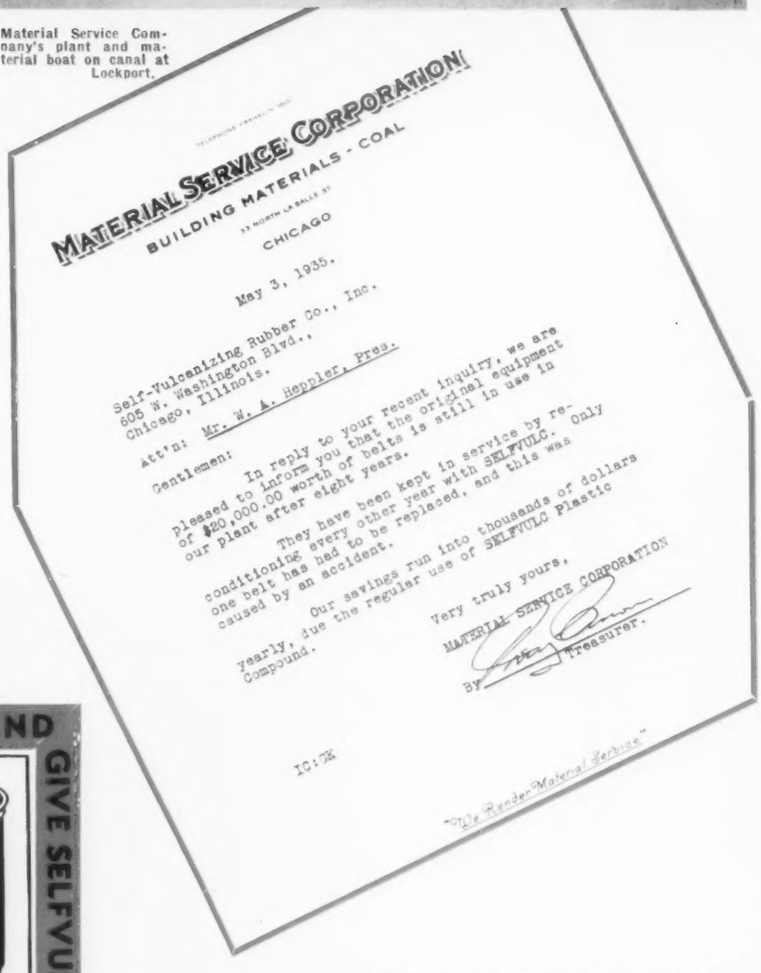
AVE THOUSANDS OF DOLLARS ANNUALLY IN REPLACEMENTS

as told in this letter—a typical experience among users throughout the country.

Material Service Company's plant and material boat on canal at Lockport.

YOU can duplicate these economies in your own plant by keeping your conveyor belts in prime condition with this plastic rubber compound. At the first sign of wear, simply apply a coating of SELFVULC to all bare spots—your own workmen can do the job without removing the belts from the pulleys. By **completely resurfacing your belts** you can triple their service life and save buying new ones for years.

Remember, SELFVULC Plastic Rubber has greater abrasion resistance than steel, and will outwear manganese steel plates—so use it for your other equipment. It gives positive protection against abrasion and corrosion when used for lining chutes, hoppers, agitators, classifiers, tube mills and dredge pumps. It pays to keep a supply of SELFVULC in your storeroom for emergencies, and for regular use. Write for details.



MATERIAL SERVICE CORPORATION
BUILDING MATERIALS - COAL
CHICAGO

May 3, 1935.

Self-Vulcanizing Rubber Co., Inc.
605 W. Washington Blvd.,
Chicago, Illinois.

Att'n: Mr. W. A. Heppler, Pres.

Gentlemen:

In reply to your recent inquiry, we are pleased to inform you that the original equipment of $20,000.00 worth of belts is still in use in our plant after eight years.

They have been kept in service by reconditioning every other year with SELFVULC. Only one belt has had to be replaced, and this was caused by an accident.

Our savings run into thousands of dollars yearly, due the regular use of SELFVULC Plastic Compound.

Very truly yours,
MATERIAL SERVICE CORPORATION
By _____ Treasurer.

IC:JK

"We Render Material Service"

ORDER THIS REPAIR KIT AND GIVE SELFVULC A TRIAL

TRIAL OUTFIT

Including 25 lb. drum of Selfvulc, 1 qt. either "F" or "M" bonding solution, 1 qt. cleaning fluid, with all tools and instructions. Specify "F" for bonding to rubber or canvas. "M" for bonding to metal or wood.

WELCOME to the SELFVULC Booth No. 54
at Jefferson Hotel, St. Louis, January 27 to 31—The 1936 Conventions of National Associations of Sand, Gravel, Slag, Crushed Stone and Ready-Mixed Concrete Producers.

SELF-VULCANIZING RUBBER CO., Inc.
605 Washington Blvd. CHICAGO, ILL.

It's got what it takes for rough, hard digging!!

NEW and with exclusive features that make the OSGOOD line the fastest, easiest controlled and most economical machines in the excavating machinery field.

OSGOOD

COMMANDER III

Brilliant—N E W—Advanced Engineering Features

Performance and Output the Greatest in the History of Excavating Machinery

NOW—YOU can own a digging machine as modern in design, as accurately built and as smooth in operation as today's Motor Car. OSGOOD COMMANDER III is typical of the entire greater OSGOOD line which includes CONQUEROR CV, VICTOR MV and the CHIEF —sizes range from ¾ cubic yard to 2 cubic yard and can be furnished as Shovel, Crane, Dragline or Clamshell—and each is convertible in the field to any one of these services by merely changing the boom equipment.

All are built to the rugged, well-balanced and proven standards that have made OSGOOD famous for nearly seventy (70) years. All are equipped with Gasoline, Diesel or Electric Motors—whichever you like.

THESE ARE THE DIGGING MARVELS OF A MARVELOUS AGE!!

Bulletins, Specifications and Photographs are YOURS. Ask for them.

Digging blasted rock with the OSGOOD Chief 1¾-2 cubic yard machine.

Ripping out the hard rock that makes Manhattan Island. The Chief working on the depression of the N. Y. Central tracks.

Dependable and capable. Osgood Shovels, Cranes and Draglines are famous as consistent performers.

THE OSGOOD CO.

• Marion, Ohio •

Where Long Hauls Would Shut You Out

This PORTABLE CRUSHER *puts you "in" at a* PROFIT

Enlarge your market—gain a competitive advantage—by owning an Austin-Western Portable Crushing-Screening Plant

● Fixed plant producers are making more money from present business and getting more business from a larger territory by operating Austin-Western Portable Crushing and Screening Plants.

It gives them a chance to bid on jobs which were formerly out of their territory and the machines themselves are so cheap to operate that costs are cut on many a former long haul job.

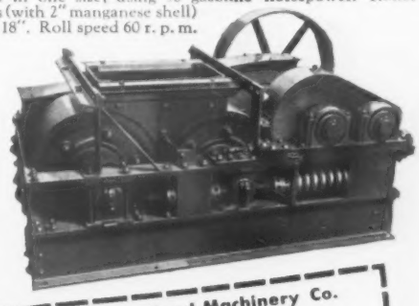
The Number 100 Portable Plant has a 9" x 40" primary roller bearing jaw crusher and an 18" x 38" roll (or 4" x 40" jaw) crusher for reduction crushing.

All portable plants have oversize shafts and roller bearings throughout. They are built to meet the growing demand for smaller sizes of stone now so generally used for road construction.

Compact for easy transport on steel or pneumatic tired wheels, they can be set up for operation in a few hours.

The Austin-Western Primary Breaker No. 1838
This jaw-type crusher gives you large capacity at low cost per yard. With best roller bearings available, it operates at full capacity without bearing or shaft troubles.

The Austin-Western Roll Crusher No. 3018
Available in one size, using 50 gasoline horsepower. Roller diameters (with 2" manganese shell) 30", face 18". Roll speed 60 r. p. m.



Austin-Western

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The Austin-Western Road Machinery Co.
A-7, Aurora, Illinois

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AMERICAN PORTABLE PLANTS

American portable crushing plant reducing "man-size" stone to ¾" aggregate product in one reduction at the rate of 300 tons per day.

A Few of the Outstanding Features

Lower First Cost • No Slivers or Chips
Minimum Fines • Cheaper Installation
Cost • A Uniform Cubical Product

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American Pulverizer Company
1289 Macklind Ave., St. Louis, Mo.

Please send me complete information about the New American Crusher.

Name .....
Firm .....
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AMERICAN equipment is backed by over 25 years experience in manufacturing reduction equipment. If you want a rugged and compact unit that will handle more tonnage per hour and produce the proper kind of gradation—be sure to investigate the AMERICAN. Portable and stationary units available in capacities from 10 to 300 tons per hour. Remember these units do the job cheaper, faster and better.

●

AMERICAN PULVERIZER CO.
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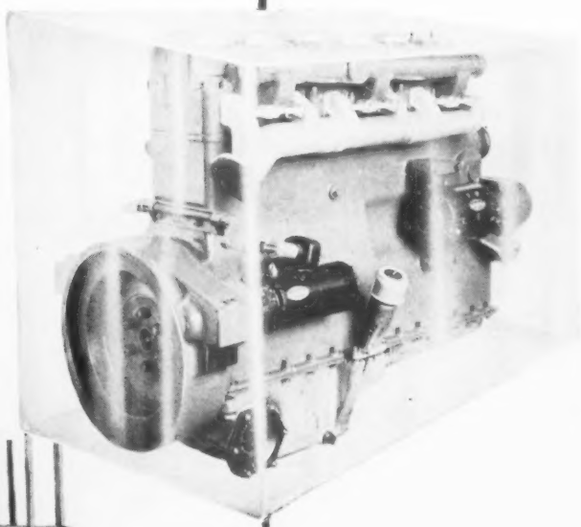
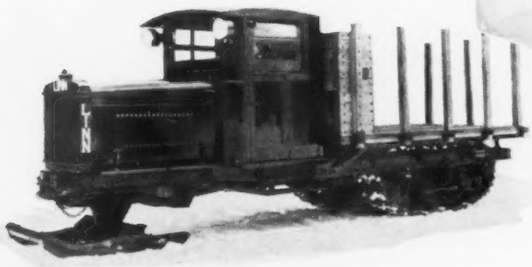
Read the record

You don't have to "warm up" a CUMMINS-DIESEL





Mussens Limited use a Cummins-Diesel powered Linn Tractor to haul supplies from their base to the mine at God's Lake, Manitoba. The tractor must break its own road, pulling a 35-ton load. Weeks at a time, temperatures are 40° F. below zero.

Mr. W. H. Mussen, President, reports that even in these severe temperatures, the Cummins-Diesel Engine gave "no trouble of any kind."

Fuel economy in this section is doubly important. Sufficient fuel must be carried for the round trip, which takes 72 hours. The cost of operating the tractor with the Cummins-Diesel shows a saving of more than 7c per mile, as compared with a gasoline powered tractor.

This is another striking demonstration of the quick-starting and fuel-economy of Cummins-Diesels under the severest sub-zero weather conditions.

See your nearest Cummins dealer or write direct to Cummins Engine Company, 800 Wilson Street, Columbus, Indiana.

● **Cummins-Diesels are cold-starting. *"Read the Record."* . . . Ask for new booklet just published.**

CUMMINS
INDUSTRIAL · AUTOMOTIVE AND MARINE
DIESELS

Better Roller Mills for Fine Grinding

100 to 400 mesh fineness.

Unusually accurate air separation.

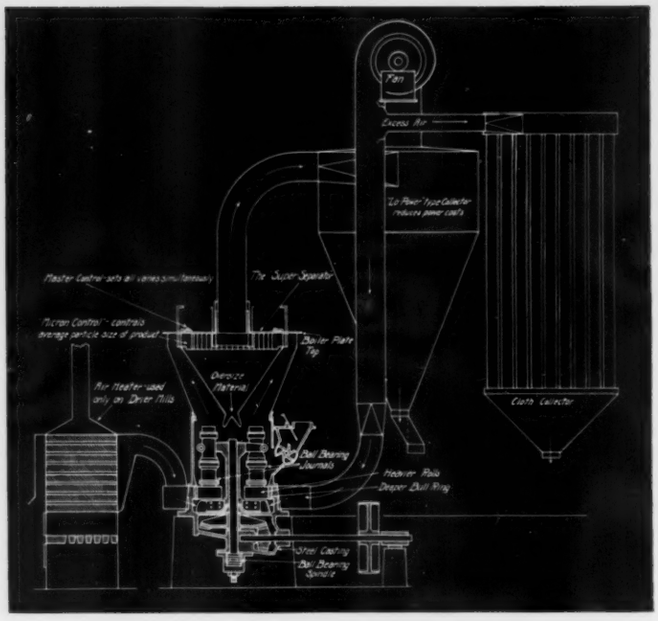
Instantly changeable from one fineness to another.

Steel castings at important points.

Ball bearing roller journals.

Dry and grind in one operation.

Lower fine grinding costs.



Better Hammer Crushers for Coarse Crushing

Crush power shovel loaded rock to commercial sizes in one operation.

One crusher does the work of three resulting in 50% to 75% smaller investment.

Handle wet or muddy rock.

Adjustable to make more or less fines.

Product is approximately cubular with no slivers or slabs.

18 popular sizes including portables.

Williams Patent Crusher & Pulverizer Company
802 St. Louis Avenue, St. Louis, Mo.
Sales agencies in all principal cities.

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OLDEST AND LARGEST BUILDERS OF HAMMERMILLS IN THE WORLD
PATENT CRUSHERS GRINDERS SHREDDERS

Today it's LIMA SHOVELS, DRAGLINES and CRANES

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RAND COULEE DAM - FORT PECK DAM - BONNEVILLE DAM - QUIBBIN RESERVOIR DIKE - METROPOLITAN AQUEDUCT - MUSKINGUM VALLEY - HETCH HETCHY PR
SKYLINE DRIVE - CASPER ALCOVA PROJECT - PINE VIEW DAM - THE LEVE
FRANCISCO-OAKLAND BAY BRIDGE

See Our Exhibit Booth A-6

Cleveland Road Show
JAN. 20-24

We cordially invite you to make our booth your headquarters while attending the Cleveland Road Show. There you will find the excavators that are setting the pace for shovel, dragline and crane design.

Comparisons prove that it is more economical to handle your excavating with LIMA shovels, draglines and cranes.

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BOOTH No. 44
JOINT EXPOSITION
ST. LOUIS, MO., JANUARY 27-30

LIMAS ARE BUILT IN CAPACITIES FROM 3/4 TO 3 YARDS

GUARANTEED SERVICE

CONCENTRATOR

SCREENING AND WASHING EQUIPMENT

THE Leahy

"NO-BLIND" VIBRATING SCREENS

Simple and practical, LEAHY Screens operate at slow speed for higher rates of vibration suited to the problem handled. The vibrator with its "lifetime bearings" is sturdily built, foolproof, entirely enclosed and running in oil. All parts are improved and furnished of materials which reduce maintenance to a minimum—actually guaranteed not to exceed 1% per year of your screen investment. LEAHY Screens are profit producers on wet or dry screening of material from 3" opening down to 100-mesh. Ask for details.

DEISTER DIAGONAL DECK OVERSTROM

D-O DIAGONAL DECK WASHING TABLE

Heavy-duty, high-capacity equipment for cleaning sand or gravel—no matter how dirty the pit or river deposit may be. Efficient table action removes coal, clay, sticks and debris rapidly and thoroughly, producing a premium product at low cost. Capacity ranges from 18 to 45 tons an hour, depending on size of material treated. It handles sizes from fine sand up to 2-inch gravel. Bulletin sent on request.

The Original

DEISTER CONCENTRATOR COMPANY

911 Glasgow Avenue Ft. Wayne, Ind.

New York Office: 104 Pearl Street

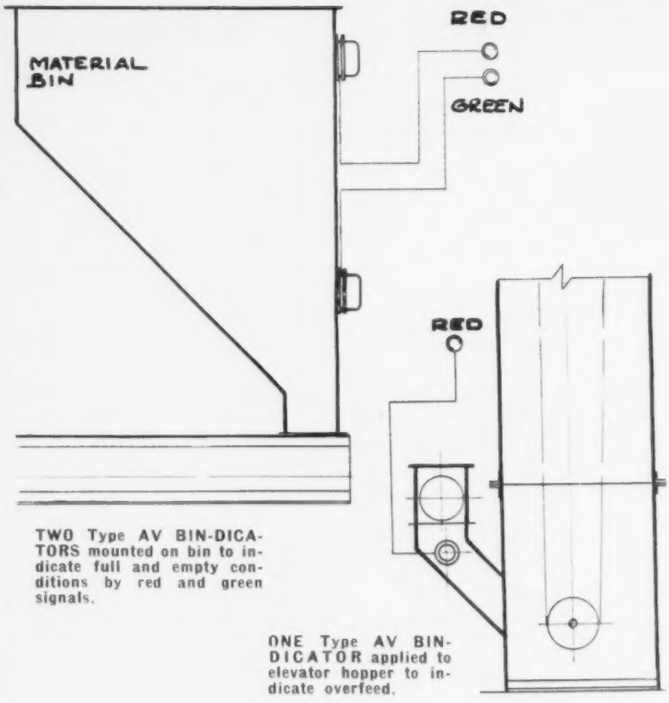
INCORPORATED 1906

STOP-GO

Signals for Bins

BIN-DICATOR

(BIN LEVEL INDICATOR)



TWO Type AV BIN-DICATORS mounted on bin to indicate full and empty conditions by red and green signals.

ONE Type AV BIN-DICATOR applied to elevator hopper to indicate overfeed.

MODERN bin control methods, developed by Ripley engineers, are going into thousands of plants in answer to the demand for greater economy in material handling for 1936.

Here is automatic indication and control at its best. Its successful results in the cement industry for the past five years have brought it to the attention of other industries wherever bulk materials are handled.

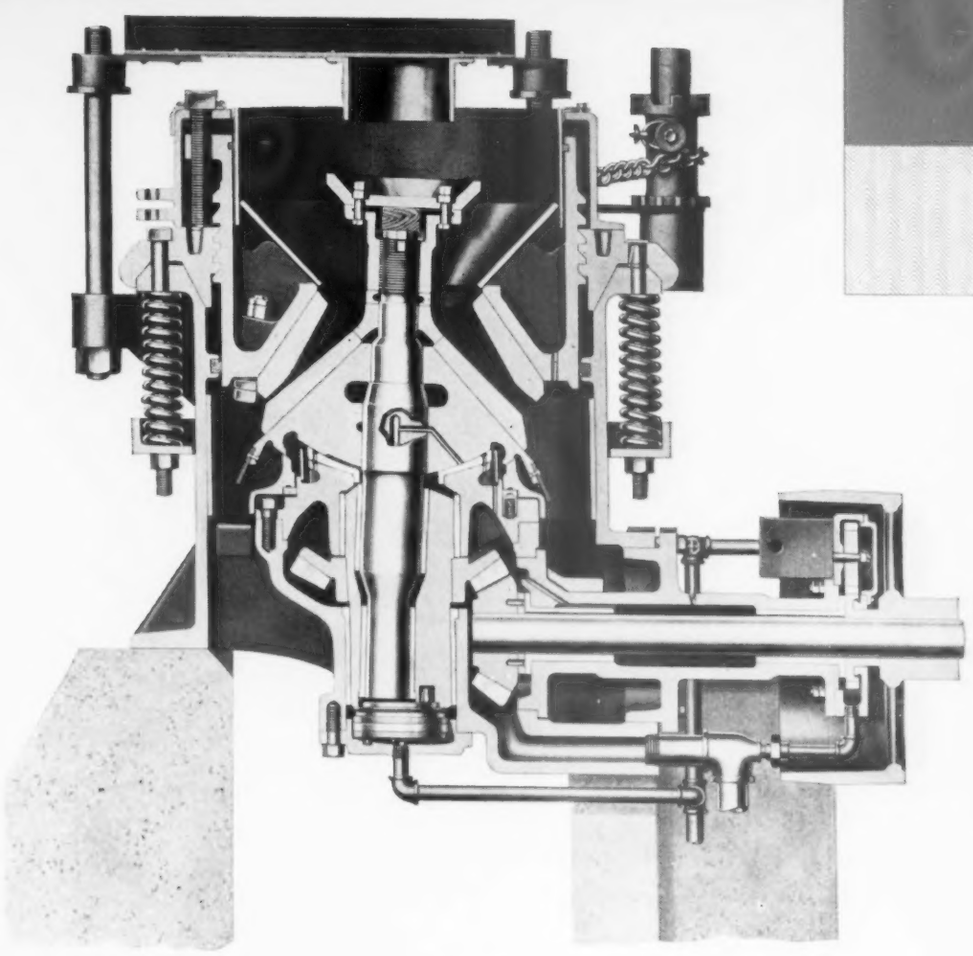
THE BIN-DICATOR is a positive acting, easily installed unit for controlling the feeding of material to conveyors, elevators, hoppers, packers or bins of any type. It may be used singly to indicate the level of material at any desired height, or in a double set for limiting the bin level between definite limits. Requires no maintenance.

Write for Bulletin, containing details and applications.

RIPLEY MANUFACTURING CO.

WAYNE, MICHIGAN

NOW AVAILABLE *in a* SMALLER SIZE



The New
20 INCH CONE

Has all the features of the larger cones

Perhaps you are one of those producers who has always wanted a crusher with the advantages of the Symons Cone, but your operations were too small for the sizes in which they were built. It was to meet this demand that we brought out this smaller crusher, one that gives to small and medium sized plants all the advantages afforded by Symons Cone Crushers.

Write for descriptive folder, or let us tell you about it at the St. Louis Convention.

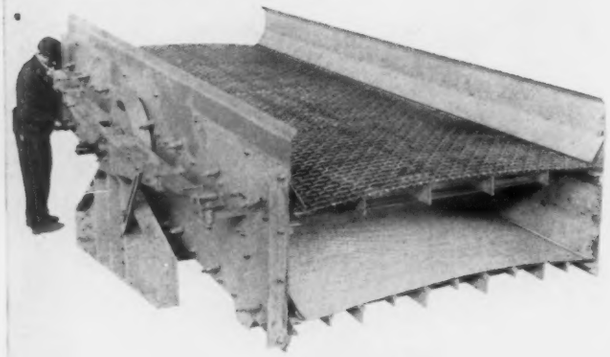
NORDBERG MFG. CO., MILWAUKEE, WIS.

NEW YORK CITY	LOS ANGELES, CAL.	LONDON, ENG.	TORONTO, CANADA	MEXICO CITY, MEX.
60 E. 42nd Street	Subway Terminal Bldg.	Bush House	Concourse Bldg.	Edifico Cook 413

SYMONS CONE CRUSHER

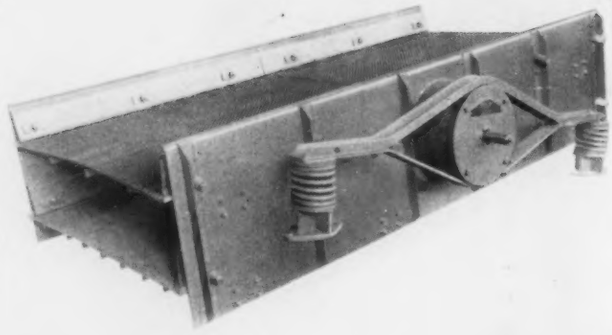
SCREENS

GYREX



FOR COARSE SCREENING

VIBREX



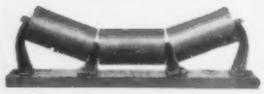
FOR FINE SCREENING

The screen must fit the job to be done if the user is to enjoy the full benefits of modern screen design. That is why Robins has developed two distinct types of screens . . . GYREX and VIBREX . . . in more than a hundred and fifty sizes, styles and models. The Robins engineer who calls on you can therefore be impartial, he has a complete line from which to select a screen that exactly fits your work. Ask his advice.

Robins also builds, for the aggregates industries, dependable belt conveyors and a host of other material-handling units as well as complete plants.

Visit our booth No. 1 at St. Louis

EQUIPMENT ITEMS



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MATERIAL HANDLING
ROBINS
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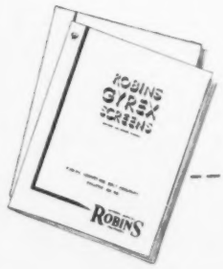

ROBINS CONVEYING BELT COMPANY
15 Park Row, New York City

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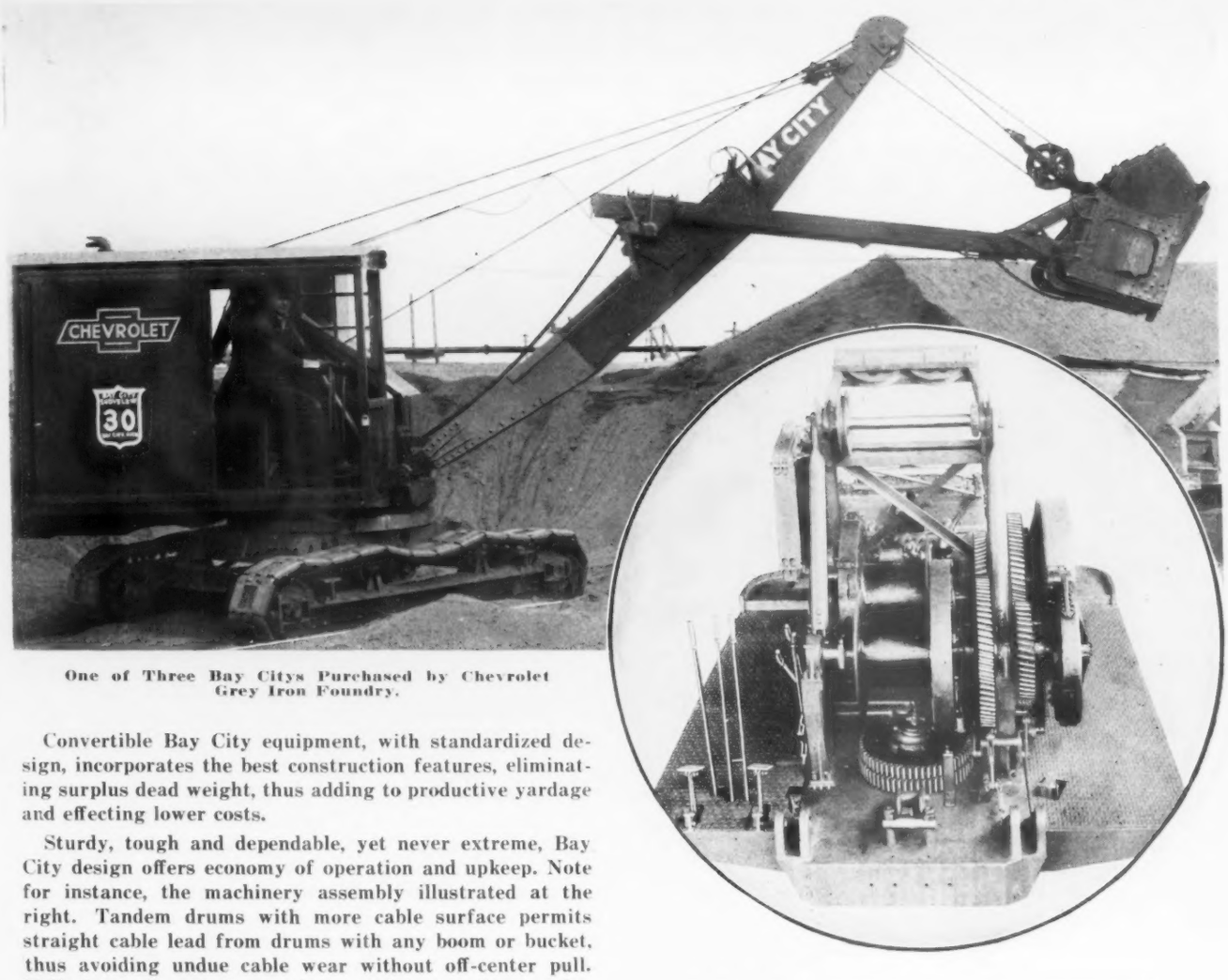
Please have representative call .....
Name .....
Firm .....
Address .....
City ..... *State* .....



One of Three Bay Citys Purchased by Chevrolet Grey Iron Foundry.

Convertible Bay City equipment, with standardized design, incorporates the best construction features, eliminating surplus dead weight, thus adding to productive yardage and effecting lower costs.

Sturdy, tough and dependable, yet never extreme, Bay City design offers economy of operation and upkeep. Note for instance, the machinery assembly illustrated at the right. Tandem drums with more cable surface permits straight cable lead from drums with any boom or bucket, thus avoiding undue cable wear without off-center pull. Helical cut alloy steel gears insure quiet, smooth operation and longer life. This efficient machinery arrangement and design is standard on all Bay City full-revolving models.

Before you buy your next shovel, compare Bay City construction materials, design, accessibility, speed, working ranges and safe load capacity with any machine in the same capacity or weight class. You can't beat Bay City value regardless of what you pay.

AT THE ROAD SHOW

Cleveland—January 20-24

See the NEW BAY CITY
3/8 Yd. Full Revolving

A 10 ton machine that can really "take it." All modern features of design, and unit castings. Strength and sturdiness not sacrificed for light weight or price.

FIRST PUBLIC SHOWING

—Also—

Model 62—One Yard Diesel Shovel

25 REASONS for CHOOSING a BAY CITY

1—Convenient economical weight.
2—Helical cut gears—noiseless, long wearing.
3—Unit (nickel-manganese) car body and machinery table, totally heat treated.
4—Frictionless bearings throughout.
5—6 cylinder power.
6—Extra large diameter swing roller-path.
7—Oversized clutches and brakes.
8—Drop forged crawler shoes.
9—Long crawlers—low bearing pressure.
10—Chain crowd with automatic adjustment.
11—Swing lock—in any cab position.
12—Automatic Travel lock.
13—Extra heavy cab. Plenty inside working room.
14—Fast operating speeds.
15—Two travel speeds.
16—All steel construction.
17—Three lever control.
18—E-Z clutch control.
19—High pressure lubrication throughout.
20—Safety worm boom hoist.
21—Separate hoist drums.
22—Internal swing teeth.
23—Unequalled steering at full speed.
24—Convertible—without machinery change.
25—Accessibility for inspection or adjustment.
10 Models—3/8 to 1 1/4 yd.

BAY CITY SHOVELS Inc. (Eastern Offices, Roselle, N. J.) **BAY CITY, MICH.**

How RAYMOND CHANGES THE PULVERIZING PICTURE YEAR AFTER YEAR

REVIEW industrial history for the past half-century, and you will find that the major developments in pulverizing and separating machinery were pioneered and put into practical application by Raymond engineers.

Air Separation was as revolutionary an advance in 1887, as Flash Drying is today. Just as the first Raymond mills set records for low costs in the early nineties, so today sensational savings are shown by the Raymond BOWL MILL.

For this machine embodies the best in Raymond experience and the latest in modern engineering design. Capable of running months without any shutdowns—adjustable to the fullest degree while operating—elimination of metal-to-metal contact—negligible friction losses—high grade roller and ball bearings automatically lubricated—all result in new low costs per ton of product.

If the Bowl Mill applies to your problem, you are assured of extraordinary economies. Write for Catalog.

RAYMOND BROS. IMPACT PULVERIZER CO.

Division of Combustion Engineering Company, Inc.
1321 North Branch Street, CHICAGO
Sales Offices in all Principal Cities
Canadian Representative:
COMBUSTION ENGINEERING CORPORATION, LTD.
MONTREAL

VOLUME 28 NUMBER 7

Pit and Quarry

With which is consolidated

CEMENT-MILL & QUARRY

CHICAGO, JANUARY, 1936

Predict 10 Per Cent. Better Business in First 1936 Quarter

Business in the first quarter of 1936 will be slightly better than 10 per cent. greater than in the first three months of 1935 in the pit-and-quarry industries, according to the carloadings estimate made by the 13 shippers' regional advisory boards. These boards' predictions are always extremely accurate and have come to be considered the best of the business indicators in this country.

Estimated loadings of sand, gravel and crushed stone for the period have been placed at 162,521 cars, against actual loadings of 147,033 cars in 1935 . . . a gain of 10.5 per cent.

Cement shipments will reach 53,967 cars, it is estimated, compared with actual loadings in the first 1935 quarter of 48,345 cars, or 11.6 per cent.

Building Continues to Record Healthy Gains

NOVEMBER AWARDS UP 68 PER CENT.

The construction industry continues to record larger activity than was shown a year ago. For November a contract total for all classes of construction in the amount of $188,115,000 was reported by F. W. Dodge Corp. in the 37 eastern states. This was an increase of about 68 per cent. over the total of $111,691,500 reported for the same area in November, 1934. Last month's construction volume, however, failed to attain the level of $200,595,700 reported by the Dodge organization for October of 1935.

November awards for residential building, as apart from other classes of construction, totaled $39,695,200 in the 37 eastern states; this was practically twice the total of $19,909,700 shown for November of last year and compares with $55,100,300 reported for October, 1935.

Nonresidential building undertaken during November amounted to $68,080,300 as against $39,439,500 for November, 1934, and $59,180,400 for October, 1935.

Heavy engineering types, generally classified as public works and utilities, undertaken during November in the 37 eastern states amounted to $80,339,500. This compares with $52,342,300 for November, 1934, and $86,315,000 for October of this year.

For the eleven elapsed months of 1935 total construction of all types undertaken in the 37 states amounted to $1,580,408,400 as against $1,450,423,500 for the corresponding eleven months of 1934; this represents a gain over last year of 9 per cent.

The most striking improvement in construction has occurred in residential building. For this class of construction the total for the elapsed eleven months of 1935 amounted to $433,703,000 in the 37 eastern states as against only $234,289,600 for the corresponding eleven months of 1934; this represents a gain of 85 per cent. over 1935.

Medusa Plans to Install Separators at Wampum

★ Two 16-ft. Sturtevant separators are to be installed shortly in the raw-grinding department at the Wampum, Pa., plant of the Medusa Portland Cement Co. The separators will operate in closed circuit with the raw tube mills.

The company hopes, through this installation, to lower power requirements in the raw-grinding end of the mill as well as to improve the kiln feed by eliminating the coarser particles.

Monolith Gets Contract for Mono Basin Cement

On its combined bid of $2.10 per bbl., the Monolith Portland Cement Co., has been awarded a contract for 204,000 bbl. of cement by the Los Angeles Bureau of Power and Light. The cement will be used in the construction of the Mono Basin project.

Instead of asking delivered prices, the bureau called for bids on prices f.o.b. mill on one contract and for transportation as a separate contract. The Monolith company's bid for the material was $1.46 and for trucking it to the job its figure was 64c.

Delivery will be made during the course of construction, estimated at two years, with minimum requirements about 300 bbl. daily when concreting operations begin.

★ The Idaho Portland Cement Co. has purchased a Schaffer Poidometer for its plant at Inkom, Idaho.

St. Louis Convention Plans Are Completed

EXHIBITS FAR TO OUTSTRIP 1935

Advance indications are that the concurrent conventions of the National Sand & Gravel Assn., National Crushed Stone Assn., National Slag Assn., and the National Ready Mixed Concrete Assn., to be held during the week of Jan. 27 at St. Louis will attract the largest gathering of producers and equipment makers in the history of the industries. All convention sessions are to be held at the Hotel Jefferson and the building will also house the Joint Machinery and Equipment Exposition.

Sale of booth space at the machinery show has exceeded the most optimistic expectations. Many more booths have been sold than had been looked for, space far exceeding that occupied at the gathering at Chicago, a year ago.

Convention programs were reviewed in the December issue of PIT AND QUARRY and complete programs will be available at headquarters at St. Louis on the opening day of the gathering.

Hotel reservation cards and railroad certificates have been mailed to all member companies of the participating groups.

Coal Pulverizers to be Added at Quebec Plant

★ Plans are going forward for the installation this winter of new equipment for pulverizing coal at the Hull, Que., plant of Canada Cement Co., Ltd., according to John Narsted, chief engineer. The equipment will be supplied by the Babcock & Wilcox Co.

Advances in Highway Technique Disclosed

RESEARCH BOARD MEET DRAWS 378

The Highway Research Board meetings at Washington, D. C., on December 4, 5 and 6 drew highway officials engineers, educators, students, and representatives of materials and equipment groups from every part of the United States making a total registration of 378, an increase of 7.1 per cent. over the attendance of last year.

The experience of Ohio, Missouri and Kansas with the use of vibrated concrete road slabs was reported by representatives of each of those states. Apparently they intend to continue the use and study of vibrated concrete since it permits the saving of 6 per cent, or more in the quantity of cement required to give the required strength of concrete.

"Sodium Sulphate Tests of Aggregates" was discussed in a report by Dr. H. F. Kriege who pointed to the characteristics of the test method which make it so difficult to insure uniformity of procedure.

Of ever increasing interest to those who follow the trends in road materials and the advances in the science of road construction is the subject of "Stabilized Roads." Although a clear understanding of the phenomena resulting in stabilization sometimes requires a comprehensive knowledge of little-known physical and chemical laws, it is readily appreciated that the supporting value or stability of an aggregate containing clay-size material is greatly influenced by moisture conditions and by the chemical composition of the finer particles of the soil or aggregate. Calcium-chloride or sodium-chloride highway projects involving more than $33,000,000 of funds have been planned.

The year's work also brought to completion the improvement of 1,232 miles of main highways in the national forests, raising the total of such roads improved to date to 6,231 miles. Of the mileage improved during the year 1,150 miles were in western and 82 miles were in eastern forests.

Tennessee Producer to Furnish Ballast to TVA

Contracts for 10,000 tons of track ballast have been awarded by the Tennessee Valley Authority to the American Limestone Co., Knoxville, Tenn. The stone will be used on a branch of the Southern Railway at Middleboro, Tenn., which has been relocated by the Authority.

1935 Shipments Higher at Rogers City Quarry

The shipping season from the Rogers City, Mich., plant of the Michigan Limestone & Chemical Co., closed last month and activities have been halted at the plant and quarry until spring navigation opens. Shipments were reported to be 20 per cent. greater than for the preceding year.

Early in February the company plans to erect additional storage facilities. General repair work and the usual stripping operations are also expected to get under way about the same time.

Revive Lime Production at Workings in Indiana

It is reported that after more than 20 years of inactivity the Monitor Lime Kilns in Delphi, Ind., will again be in operation in the near future. An organization of business men from northern Illinois, Ohio and Indiana, interested in chemical lime and calcium carbonate, have leased 20 acres of ground for 20 years. This site, it is claimed, contains a good grade of limestone, and agricultural lime will be manufactured. The offices will be at Indianapolis and Hammond.

New Concern Takes Over O. K. Plant in Kentucky

The Union Sand & Gravel Co. has been formed at Uniontown, Ky., to succeed the O.K. Sand & Gravel Co. Members of the new corporation are: Fred Alloway, president; Jay H. Stoll, secretary and treasurer; and Joseph Chick, field representative. The new firm has just contracted to supply 8,000 tons of material for a local road project.

Gravel Company Changes Hands at Phoenix, Ariz.

The W. E. Hall Co., P. O. Box 296, Phoenix, Ariz., has succeeded Schmidt-Hitchcock, Contractors, of the same place. W. E. Hall is president of the new company and R. H. Simons is vice-president. D. A. Kavanaugh is superintendent of the sand-and-gravel plant which has an annual capacity of 95,000 tons.

Relocation of Highway Forces Change in Plant

Due to the new state highway cutting through its property, work has been started to move the plant of the Fitzpatrick Sand & Gravel Co., Worcester, Mass., to the other side of the river. Mr. Fitzpatrick, president, stated that the company is not contemplating buying new equipment, but would use what it has in the old plant.

★ A Babcock & Wilcox coal pulverizer has been installed at the plant of Basic Dolomite, Inc., of Cleveland, O.

★ The American Colloid Co., Lead, S. D., has purchased a Bonnot disintegrator and mixer for breaking bentonite.

Employment Indexes Show Seasonal Drop

CEMENT INDUSTRY MARKS TIME

Seasonal declines were experienced in November in the quarrying and cement industries, although this drop was not as severe this winter as it has been for a number of years past. Government-financed building and the WPA program at its peak are largely responsible for the improved condition.

In the quarrying industry as a whole, the employment index for November stood at 46.7, showing a drop of 6.5 from the preceding month and 5.7 from November, 1934. In November, reports from 1,087 quarries showed 29,971 workers employed compared to the October figure of 32,061 for the same number of establishments. Payrolls stood at $517,857 for one week, a decrease of 12.2 per cent. from the payroll of October of $589,828 for the same period.

EMPLOYMENT AND PAYROLLS IN THE QUARRYING AND CEMENT INDUSTRIES, BY MONTHS

Mo.	Quarrying and Non-metallic Mining			Cement		
	Plants Reporting	Employees	One-Week Pay-Roll	Plants Reporting	Employees	One-Week Pay-Roll
Oct.	1087	32,061	$589,828	138	19,925	$392,612
Nov.	1087	29,971	517,857	138	18,697	371,733
Ch'ge		—6.5%	—12.2%		—6.2%	—5.3%

The employment index in the cement industry dropped from 52.9 in October to 49.6 in November. In November, 1934, the index was 48.2. Reports from 138 plants in November showed 18,697 employees as against 19,925 in October, a drop of 6.2 per cent. One-week payroll figures for November were $371,733 while for the same period in October it was $392,612, a loss of 5.3 per cent.

Lime Plant in Tennessee Adding More Equipment

Improvements are being made at the plant of the Erin Lime & Stone Co., at Erin, Tenn. A new air compressor and drills have been installed and a new crusher is to be placed in operation shortly, it is reported. A new hydrating plant is also in prospect later on in the year.

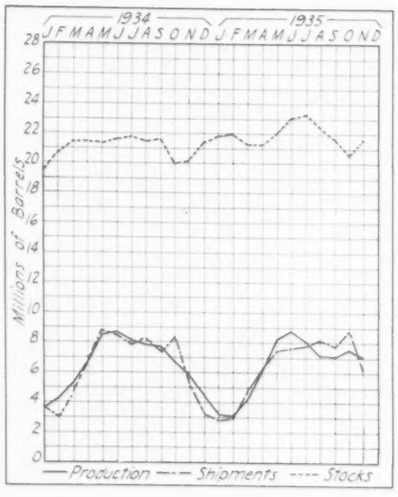
According to E. W. Rauscher, sales manager, output is to be considerably increased this year. The company recently contracted with the city of New Orleans for considerable tonnage to be used for water softening and purification.

★ The Michigan Alkali Co., Wyandotte, Mich., has recently contracted for the purchase of three huge Kritzer hydrators. Two of the machines have already been shipped; the third will be ready soon. These hydrators, said to be the largest ever built, may revolutionize production in the future, it is reported.

Cement Production, Shipments Hold Up

NOVEMBER ACTIVITY EXCEEDS 1934

The Portland-cement industry in November, 1935, produced 7,086,000 bbl., from the mills and had in stock at the end of the month 21,611,000 bbl. Production and shipments during the month showed respective increases of 22.6 and 5.3 per cent. as compared



Cement production, shipments and stocks to November, 1936.

with November, 1934. Stocks of cement at the mills were 7.6 per cent. higher than a year ago. These figures, released by the United States Bureau of Mines, were compiled from reports from every plant in the country except one.

The ratio of production to capacity in November, 1935, was 32.2 as against 26.2 for November a year ago.

Nebraska Pits Busy on Missouri River Project

Cass County, Neb., is furnishing a large portion of the rock for rip-rapping on the Federal Missouri River project. Among the companies quarrying rock are the Tobin Construction Co., Kansas City, Mo., located in the Nehawka district, and Cass County Quarries and Jasper Stone Co. of Weeping Water, Neb., the latter owned by C. F. Lytle of Sioux City, Ia.

Plasticity of Lime Is Aided by Excess Water

The Building Science Research Station in England has conducted tests showing that hydration with an excess of water gives greater plasticity than results when merely sufficient water to satisfy the chemical reaction is added. It was found that plasticity and workability are greatest when the lime particles are very small and are surrounded by a lubricating envelope of absorbent water. The size of particles is influenced during the process of hydration by the amount of water used and the temperature. Hydration with water vapor gives results similar to those obtained when the lime is hydrated with a slight excess of water.

Tests were also made to determine the effect of small additions of aluminum sulphate during hydration. Theoretically the aluminum sulphate should react with calcium hydroxide to form calcium sulphate and aluminum hydroxide. The latter compound is insoluble in water and as it is gelatinous it would tend to lubricate the lime particles and thus increase the plasticity of the hydrate. These conclusions were verified by experimental work.

Install Second Crusher at Massachusetts Plant

★ The Blue Stone Quarry, Inc. of New Bedford, Mass. has recently purchased its second No. 25 Kennedy gearless ball-bearing crusher with synchronous motor manufactured by the Kennedy-Van Saun Mfg. & Engineering Corp.

New Coal Pulverizers Eliminate Dust Losses

★ The Oglesby mill of the Marquette Cement Mfg. Co. has been improved with the installation of new coal-pulverizing equipment, necessitating a suspension of operations of about three weeks. The new pulverizing units are Babcock & Wilcox coal mills and will eliminate much of the dust loss occasioned in grinding and handling coal with the present equipment.

Pharr, Tex., Contractor Buys Havana Gravel Co.

Sale of the Havana Gravel Co. pit and plant at Mission, Tex., to the Fordyce Gravel Co., also of Mission, has been announced. R. W. Briggs, contractor and road builder of Pharr, Tex., becomes owner of both concerns.

New Method Impregnates Color in Building Stone

A process, by which limestone can be impregnated with color and polished to a high degree, has been perfected by Fred Bluem (a German-born sculptor) and his son Kurt, in their basement workshop in Bloomington, Ind.

The process will make the limestone usable for interior decoration, but further experimentation is necessary before it can be used for outside finishing.

So far only a few colors have been developed, including red, brown, lilac, green and purple-red. The color impregnates the stone from one-quarter to one-half of an inch. It does not fade, but becomes stronger with time and works best on imperfect stone.

New Firm to Market Breerwood Process

THREE FIRMS CLOSE CONTRACTS

The Separation Process Co. was recently organized, with its main office in the Fuller Building, Catasauqua, Pa. Its principal purpose is to market the Breerwood process for preparing cement raw-material mixtures of correct chemical and physical composition from inferior available materials. The company is prepared to design, equip and install minerals-separation plants, including classification, froth flotation, concentrating and thickening equipment. Three cement companies have recently closed contracts for complete separation plants.

A complete research and test laboratory has been established at 120 Bridge St., Catasauqua, Pa., to conduct all future preliminary work on cement materials and other oxidized ore minerals. In addition to an analytical department, the laboratory is equipped for both laboratory and commercial-scale operations. It is now ready to accept samples of materials for test purposes.

The Breerwood process was first described in PIT AND QUARRY, July, 1934, p. 41, particularly with reference to the Valley Forge Cement Co., in whose plant all the cement manufactured since March 15, 1934, has been made in accordance with the new process.

The company has acquired the Breerwood patents and applications. Its officers are C. H. Breerwood, president; A. E. Douglass, vice-president; R. S. Weaver, treasurer; and S. E. Danner, secretary.

G. L. and A. Shareholders Approve Reorganization

A plan of reorganization, whereby the capital assets of the company will be revalued, was recently approved by a special general meeting of shareholders of Gypsum, Lime and Alabastine, Canada, Ltd., with head office in Paris, Ont.

The plan adopted provides for the writing down of 460,876 shares of no par value now carried on the books at $6,193,393, to a level in line with current worth. Various assets and investments will be written down, and good-will, patents and capital stock held by trustees for the employees will be written off.

Iowa Falls Plant Keeps Two Work Shifts Busy

Two shifts of 8 men each are at work at the plant of the Iowa Falls Sand & Gravel Co., Iowa Falls, Ia., filling orders for 6,000 tons of crushed stone for the Webster City-Boone paving job on Highway 60, and 1,100 tons for a street paving job at Ames. One hundred car-loads of rock will be shipped.

Aggregates Treated for Building Roads

OPENS UP MARKET FOR PRODUCERS

A recent development which provides a process for waterproofing mineral aggregates for use in highway construction and other building purposes, should and will lend much to the betterment of road construction and should prove to be of particular interest to producers of crushed stone, sand and gravel, and slag.

This process was developed by American Sealdrok, Inc., of Chicago. It provides that the aggregate must first be thoroughly dried and then, while in a heated and expanded condition, treated with a specially-prepared waterproofing compound, the base of which is asphalt. The lighter parts of the compound, it is claimed, impregnate the aggregate, carrying a portion of the asphalt content in with them. This leaves a light coating of asphalt on the surface of each particle of aggregate, which is actually "keyed" into it. When additional asphalt to produce a finished paving mixture is subsequently added to this treated aggregate, it fuses with that part already "keyed" into the aggregate, with the result that the entire coating is "keyed" into and equally distributed over the aggregate, thereby eliminating the possibility of peeling or raveling, it is claimed.

Aggregate treated with this process can be shipped and stock-piled for an indefinite period and no moisture can ever again enter the aggregate. Before the aggregate is treated with the waterproofing compound it is thoroughly graded to various sizes to meet any specific specifications and, by reason of the light coating of asphalt left on the surface, it can be shipped, handled and rehandled without segregation. For this reason it is attracting a great deal of attention from state highway engineers, as this specially prepared and treated aggregate can be shipped and stock-piled along the roadside or at the site of the work. Furthermore, any kind of asphalt cement can be applied by hand or through the most inexpensive kinds of equipment and will produce a paving mixture of the highest type, it is said.

It is claimed that water and frost are the most destructive elements to all types of pavements and that this waterproofing treatment eliminates this hazard. Inasmuch as more than 90 per cent. of all asphalt pavements consist of mineral aggregate, which in itself must carry the traffic load and withstand climatic changes, it necessarily follows that the life of such highways depends to a great extent upon the proper preparation and conditioning of the mineral aggregate.

For the construction of secondary or farm-to-market roads Sealdrok waterproofed aggregate can be laid direct from the source of supply or from stock-piles without adding additional asphalt, because of the fact that the waterproofing compound penetrating the aggregate leaves on the surface of each particle, equally distributed, sufficient asphalt to assure adhesion.

Through laboratory tests many other uses for Sealdrok waterproofed aggregate are being developed, such as its use in sewage-disposal plants, for covering parking areas, for use under sidewalks, in replacing cinders, and for many other purposes. Treated aggregate for these purposes has been found surprisingly economical, it is claimed. When the claims for this process are substantiated it is logical to assume that this waterproofed aggregate will be in demand and used in great quantities and that producers of mineral aggregate may be required to furnish their product in treated form.

It is understood that this process will be exhibited and explained at both the Road Show in Cleveland, and the Joint Exposition at the conventions of aggregate producers in St. Louis, both to be held in January.

Start Production Soon at South Vallejo Plant

Production is expected to get under way early in 1936 at the new plant of the Basalt Rock Co., at South Vallejo, Cal. Included in the improvements are wharf facilities for water shipments.

The Pioneer Sand & Gravel Co., Seattle, Wash., has filed an application with the war department asking permission to build a dock in Puget Sound near its producing properties at Steilacoom, Wash.

Two Cement Concerns Pay Extra Dividends

INTERNATIONAL CALLS DEBENTURES

Favorable dividend action by two cement companies has recently been reported.

Superior Portland Cement, Inc., declared two deferred dividends, totaling 55 c. a share on its Class A preferred stock, payable Jan. 2, 1936 to stock of record Dec. 23, 1935. This payment reduced arrears on the stock to $2.75 a share.

The Ideal Cement Co., Denver, Colo., declared an extra dividend of 50 c. payable Dec. 21, 1935, and the regular quarterly dividend of 50 c. payable Jan. 1, 1936, both to stock of record Dec. 15. In the three previous quarters, the company paid 25 c. quarterly and 25 c. extra.

The 5 per cent. debentures of International Cement Corp. due in 1948, were called for redemption on Dec. 30, 1935, payable at 103¼. Payment of the issue will aggregate $12,644,500.

Maine and Vermont Let 21 Highway Contracts

It is reported from Augusta, Me., that the State Highway Commission is prepared to award 14 Federal-aid highway construction contracts at a total cost of $845,803.85.

Low bids on five regular Federal-aid road jobs, totaling over $240,000, have been accepted by the State Highway Board of Vermont.

1935 Book of Tentative Standards by A. S. T. M.

The American Society for Testing Materials has issued the 1935 edition of "Tentative Standards," containing all of the A. S. T. M. tentative specifications, methods of test and definitions of terms covering engineering materials and the allied testing field. These tentative standards embodying the latest practices, are widely used throughout industry. The 1935 edition contains 290 tentative standards, displayed throughout 1,500 pages. Of these 75 are included for the first time, while some 65 were revised this year and are given in their latest approved form.

Two-course construction showing base course of Sealdrok Process being laid on pavement at Dedham, Mass.

Another view of the new pavement after construction had been completed. It is a high-type thoroughfare.

Nuisance Dust May Be Source of Profit

MOST DANGER IN FINE PARTICLES

The villain of the dust problem is a particle so fine that it is invisible to the eye, passes through nature's defenses to the uttermost limits of the lungs and travels 70 mi. after issuing from a tall smokestack before it settles to the ground, if there is a zephyr to waft it. Its size is not more than 1/25,000 of an in. (10 microns) and may be one-half of that or even less, according to M. I. Dorfan, an engineer who has designed some of the world's largest and most unique dust-collecting installations. He is manager of the dust-collector division of Blaw-Knox Co., of Pittsburgh, Pa., and a member of committees which are drafting governmental and engineering codes of dust collection.

He read a paper on the fundamentals of modern dust-collecting practice before the Greater New York Safety Conference, whose session was held recently under the auspices of the metropolitan chapter, American Society of Safety Engineers and the engineering section of the National Safety Council, with sixty-five technical, civic, industrial and health groups coöperating.

"The damage wrought by those dust particles depends on their composition," said Mr. Dorfan. "Silica has caused silicosis, a serious lung ailment; manganese, when ingested, has caused serious illness; baker's flour produces violent explosions. Some dusts are corrosive, some abrasive and others acid or caustic in their reactions. Some fumes injure crops and house paint for miles around.

"Dust is an industrial as well as a social problem. Silicosis and other dust diseases are in general not covered by workmen's compensation and recovery of damages must be by lawsuit. There are now lawsuits, meritorious or otherwise, aggregating $300,000,000, based on dust injuries, pending in American courts. One lawyer, I am informed, has no less than one hundred and fifty suits of this kind pending," he continued.

"Juries are hard to convince, for the evidence is highly technical, and neither party can be assured of an equitable decision. Manufacturers are therefore realizing that efficient dust recovery in their plants is advisable for financial as well as humanitarian reasons," he declared.

Discussing the differences in dusts, Mr. Dorfan pointed out that their effects vary curiously.

"Silica—silicon dioxide—is known to cause a serious disease, silicosis. Yet silicates in general are not known to be harmful and one of the most common, cement, contains an active calcium radical which is positively prophylactic in effect. The U. S. Health Service has even found that tuberculosis can be arrested in a cement-plant worker who continues at this work. On the other hand other common silicates have been definitely proved to be the sources of serious diseases," he stated. "Lead dust is very harmful, both mechanically and from its chemical, poisoning effect, but carbon dust has never been proved injurious, although it blackens the lungs," he added.

Dust collecting is often a source of profit which may exceed the cost of doing the work, he went on to say.

"Children's 'sparkler' fireworks and cement-floor hardener are two things made from cast-iron dust which otherwise would be a serious shop nuisance, ruining machine bearings, clogging drains and making windows unwashable. A rock-crushing plant found its dust worth more as asphalt filler than the rock itself. A coal-cleaning plant found the dust from its $1.75 coal worth $6 a ton for foundry-mold facings. A wrought-iron manufacturer who annoyed a whole neighborhood with fumes from soda ash used in his process now collects the sodium-bicarbonate dust into which the process converts the soda ash and thus obtains water-softening material for a large plant, saving thousands of dollars a year, or several times the cost of his dust-collecting installation," Mr. Dorfan declared.

Compliance with legislative requirements in the few states which have them does not fully protect either the manufacturer or the worker, because the statutes have little relation to actual needs, Mr. Dorfan pointed out, explaining that they afford ridiculous interpretations and also rely on misleading measures of dust-collecting efficiency. A movement, in which he is a participant, is now on foot to formulate a standard code on dust collection which will be recommended to every state in the union as the basis for the enactment of legislation, he revealed.

Pennsylvania and Iowa Gypsum Plants Improved

Approximately $75,000 is being expended by the Universal Gypsum Co., in alterations and repairs at two of its plants.

Improvements at Fort Dodge, Ia., are costing about $35,000 while at the York, Pa., plant, about $40,000 is being expended.

Gravel or Stone Plants Entitled to Financing

The Federal Housing Administration, Washington, D. C., has just released a 28-p. booklet, entitled *Loans up to $50,000* (F. H. A.-180), which is designed to inform merchants, manufacturers and others regarding the advantages of using government-insured modernization credit to improve business property. Gravel and crushed-stone plants are eligible.

The accompanying photograph shows the new aggregates-bituminizing plant owned and operated by American Sealdrok, Inc., of Chicago, and located at the quarry of T. J. Quinn & Sons, Inc., Ashton, R. I. This plant incorporates many new features and is said to represent just about the maximum of efficiency to be had in this type of plant.

American Sealdrok, Inc., has been expanding its operations rather extensively. It recently took over five aggregates-bituminizing plants in Pennsylvania, located at the following points: Norristown, Reading, Connellsville (Casparis), Wertz and Naginey.

The greatest expansion this company has made, however, has been along the lines of franchise grants made to existing plants throughout the country to operate under the Sealdrok patented process of waterproofing and treating mineral aggregate for bituminous paving. These franchises are given to existing operators on an exclusive territory basis for a period of years.

To Gather Statistics in U. S. Census of Business

A Census of American Business will be taken early this January simultaneously with the biennial Census of Manufactures. Both will cover the calendar year of 1935. This business man's census will provide a national picture of the number of establishments, volume of business, persons employed, wages paid, and other facts which can be compared with the previous censuses of 1929 and 1933. The scope will include banking and finance, construction by contractors and operative builders.

"We ask for the coöperation and assistance of the business men of the United States in this undertaking and assure each of you that your individual report will be held *absolutely confidential*. You will receive advance copies of the printed schedule forms in the near future," says Daniel C. Roper, Secretary of Commerce.

The Ohio River Sand & Gravel Co. of New Martinsville, W. Va., is enjoying a large business, due to having received the contract for furnishing gravel to the large dam at Grafton, W. Va. About 70 car-loads of gravel are being shipped daily.

Editorial

Individualism and Social Control

PROPONENTS of the idea of unrestricted competition, whether in business or in the other activities of civilization, proceed on the erroneous assumption that social control is a new idea. Because individualism seems to be predicated on the absence of all regulation, on a natural desire to run free from and, if necessary, contrary to the dictates of discipline, individualists, particularly those who pride themselves on the ruggedness of their principles, seem to feel that all regulation is unnatural and, therefore, opposed to society's best interests.

If history had been taught to men of our generation as something more than a record of the struggle between individuals and peoples—let us say, as a panorama of the conflict of ideas and ideals, for example—it would not have been so easy for us to fall into these simple errors. For even the most casual study of historical fact should have revealed to observant students that social control has been with us at least within historical times and, presumably, much longer. It exists to-day among the most backward as well as among the most forward peoples, and, seeing that man is a gregarious animal, there is no reason to believe that it has not always existed. It would seem to be impossible in any state of society for two men to participate in even the simplest relationships without some commonly-accepted code regulating their conduct. And as the number of participants increased it would be but natural that the extent of the regulation should similarly increase, for as the complexity of their relations grew greater, the difficulties, the misunderstandings, the opportunities for conflict and the necessity for means of correction and prevention would multiply.

Whatever the psychological explanation, it is obvious that social life is surrounded by regulation, that there are few activities that are not circumscribed by some form of externally-applied discipline. Even under the *laissez-faire* individualism of a century ago there was, if not regulation of the kind we see to-day, at least the beginnings of economic control as we know it. Not many years passed before factory acts, child-labor laws and similar forms of regulation were found necessary either to supplement or to correct the unsatisfactory operation of economic forces that were uncontrolled. A simple reliance on "economic law" had been found inadequate to insure that "greatest good of the greatest number" which the exponents of *laissez-faire* had contended would naturally follow the removal of all governmental restrictions on industry.

It was Mercier de la Rivière who had said that "Personal interest compels each man vigorously and continuously to perfect and to multiply the things he seeks to sell. He thus enlarges the mass of pleasures he can produce for other men in order to increase the pleasures other men can produce for him in exchange. The world thus advances of itself." But even in his days this optimistic faith in the power of uncontrolled individualism to produce social good was not general; in the centuries that have since passed the fallacy of the assertion has become glaringly apparent. So that to-day the question is not so much whether economic activities should or should not be controlled as the form which that control should take and the extent to which it should operate. The problem seems to be the development of some form of control that will preserve the libertarian ideals with whose evolution the Anglo-Saxon peoples have been so closely identified at the same time that the waste of property and life which recurring economic collapses, such as the one through which we have been passing, unavoidably produce can be reduced or prevented. It is quite conceivable that the cost of wise control could be much less than that of the waste incurred in repetitively alternating periods of scarcity and abundance. It is equally conceivable that some satisfactory and acceptable form, between the do-nothingness of the *laissez-faire* individualists and the insistance on universal regulation of the advocates of state socialism, fascism and similar doctrines, can be devised. That, as we see it, is one of the most important questions with which we are faced.

LONG before the present period, with its rapid trend toward more widespread and stricter control of economic activities, had arrived the soundness of the principle of government intervention had been demonstrated and accepted, even when such intervention operated negatively as well as positively, and even when it competed with private enterprise. The positive aspects of its intervention are evident in the assumption by government of the responsibility of providing public education; of assisting certain forms of activity by tariffs and subsidies; of widening markets through consular and similar services; of improving efficiency through research along scientific and statistical lines; of encouraging monopoly through the granting of patents, copyrights and franchises; and of regulating through licensing certain occupations, such as the legal and medical, which are universally admitted to be "affected with a public interest."

The negative aspects of intervention are observable in the laws regulating the preparation of food and drug products and in those otherwise designed to safeguard public health and welfare, in the prohibition of monopoly and the endeavor to enforce "free" competition, in government's toleration of monopoly in certain forms of activity subjected to

supervision, and in its toleration of some types of industrial combinations having monopolistic or quasi-monopolistic tendencies, as in the case of the National Industrial Recovery Act and, earlier, that of the Webb-Pomerene Act which legalized export monopolies.

GOVERNMENT competition with private enterprise has been so generally accepted in certain fields of activity, such as education, road-building, the transportation of mail, and the like, that they do not usually appear to us as examples of government intervention. Yet each of these activities represents a direct adoption on the part of government of services that have been and could still be rendered by non-governmental agencies. Each one has come within the sphere of governmental operation because of the conviction that government was better able to coördinate them, or because only government could operate them with proper regard for the general good, or because private enterprise could not conduct them on a profitable basis. The efficiency or inefficiency with which such activities have been or can be carried on by governments has not been the test of their fitness to survive, but rather the need which made their taking over by governments seem advisable.

We do not look forward with complacency to the extremes to which such intervention could be pushed, nor do we favor the type of regulation that seems to threaten us from all sides. We would not like to see all initiative destroyed; we would not like to see the economic incentive, which is one of the most important incentives, impaired. Neither would we like to see society continue to pay the exhorbitant price which is made inevitable by the series of economic upheavals through which it has passed. All these things seem to us to be unnecessary, unless we have lost our capacity for adjustment and compromise.

On other occasions we have expressed our confidence in our ability to meet the test of these times, which are demanding clear thinking, the discarding of prejudice, the abandonment of traditional concepts, and a willingness to face realities. We repeat it here. But to believe in this capacity is not enough; we must act upon it. Those sections of society which are the targets for the attacks that are being, have been and will continue to be leveled at our economic system, those who have most to lose in a money sense if any of the extremes mentioned above should be made effective, must adopt a more conciliatory attitude, must be prepared to make some sacrifices in order to avoid being compelled to make greater ones, must be ready to concede something to the changed conditions which confront us, if for no other reason than that the decision may mean the difference between self-preservation and extinction.

Those who believe, however sincerely, that the recent adventures of government in the field of social control are but temporary, either in their application or their justification, are, in our opinion, deceiving themselves. There is great likelihood that the temporary measures of the so-called "new" deal will become permanent, regardless of the party affiliations of succeeding government administrations. We are in a period of great changes that are inevitable and inescapable steps in social evolution, and neither persons, parties nor programs are of much importance. We have arrived at the highest level in recorded history; we have established the highest standard of living ever known. Society will not willingly recede to a lower level, but will adopt whatever plan seems able to preserve its gains and assure it a prospect of further advance. We believe that such a plan can be devised by the very men, perhaps, who cry most loudly against the need for it, by those who stand terrified by the fear of the threatened extremes and, for that reason, appear to be powerless to unite on a common middle ground. As yet they have proposed no solution worthy of serious consideration; they are relying too naïvely on their faith in the discoveries of the past; they turn too readily to reliance upon a return of the "good old days." If this attitude does not give way to one showing greater courage, deeper insight, more willingness to concede even what appears to be already lost, more readiness to look forward rather than backward, we shall be inclined to agree with Walter Lippman when he says that "because our economy has become too rigid to adjust itself by individual action, it will henceforth be a normal function of government to attempt to regulate the business cycle."

AND in our search for a solution we must look far beneath the superficial evidence that surrounds us. It is not sensible to lay the blame for present tendencies at the door of special groups or individuals, for, as we have said, the changes within which we of this day are moving transcend persons, parties and programs. Nor is it sensible to contend that the ideas that seem so repulsive are of foreign origin, for this same choice of attitude confronts society throughout the civilized world. Unrestricted individualism and social control are alternative philosophies which are contending for the honors of victory, and no one is to be held responsible for the fact that the two are pitted against each other. As one critical commentator on current trends has recently phrased it, "If private business really desires to retain power in the future, its advocates had best . . . concentrate on the march of tangible events. It is not with a few personalities that they must come to terms, but with a maelstrom of impersonal, historical forces."

This is not a new thought; it is obvious to anyone with but half an eye. Nor should it be a disturbing thought, for we have the ability to choose another and a different field of battle, where the weapons will be different, the conflict less destructive of the things we value, and the outcome more conducive to a happier and better life. Could there be any work more worthy of fine minds and adventuresome spirits in this new year than the discovery of this middle ground?

By W. E. TRAUFFER

Huge Aggregate Plant Processes 2,500 Tons

THE aggregate-producing plant which has been built at a cost of over one million dollars to supply all the aggregates required in the construction of Grand Coulee Dam is unquestionably the largest-capacity single sand-and-gravel plant ever built. Designed for a maximum output of 1,000 tons per hr. of washed and graded aggregate, the plant actually processes a maximum of 2,500 tons of raw material per hr. because of the high percentage which must be wasted.

Yet, the size of the plant is secondary to its modern and efficient design. No expense or effort was spared to insure the maintenance of adequate capacity of acceptable aggregates for this project. Evidence of the efficiency of this plant is the fact that only 35 men per shift, including mechanics, are necessary for full-capacity operation of the entire plant, including excavation, from pit to main stock-piles. The plant was designed to meet a maximum concreting schedule of 12,000 cu. yd. per day. Two modern and complete concrete central-mixing plants will utilize all the aggregates produced. A cement-blending plant insures a uniform cement by mixing the several brands used.

The aggregate plant went into production on Nov. 18 and the west mixing plant on Nov. 28 on which date the first concrete was placed. Up to Dec. 27, a total of 15,000 cu. yd. of concrete was placed and 360,000 cu. yd. of material produced. Much of the latter produced in tuning up was used for roads, filling cribs, etc. The finished product, aside from the above, has gone to filling storage space.

The Mason, Walsh, Atkinson, Kier Co. is a consolidation of three large construction companies and was formed for the carrying out of this huge project. The original contract secured by this company in September, 1934, was for the construction of a low dam to be used for water power only. This included 3,500,000 cu. yd. of concrete, 800,000 cu. yd. of rock excavation and 13,500,000 cu. yd. of earth excavation. In June, 1935, the Bureau of Reclamation made a change in the plans providing for a higher dam which could also be used for irrigation purposes. The M.W.A.K. contract was altered to build the base of the high dam up to an elevation of 1,010 ft. above sea level in the power-house sections, to an average elevation of 959 ft. for the

The aggregate plant with storage piles in foreground. Behind the screening building are the balancing pile, crusher house, raw stockpile and main conveyor from pit.

at Grand Coulee Dam of Material Per Hour

river section, and up to the base of the turbines in the two power houses. The revised contract involves approximately the same yardage of concrete as the original contract for the low dam.

The original $65,000,000 appropriated for the construction of the low dam will be used up on this contract. When additional money is appropriated a second contract will be let for the completion of the dam. The completed dam will contain about 11,500,000 cu. yd. of concrete. This will necessitate the excavating and processing of about 24,000,000 cu. yd. of material from the gravel pit and of this amount a little over half will be wasted. The spillway level will be at an elevation of 1,260 ft., the top of the gates at 1,288 ft. and the top of the roadway over the dam at 1,308 ft. The river bottom at the dam site is at an elevation of 910 ft. The average rock bottom is at about 880 ft., and the lowest point in the excavation at 780 ft. above sea level. Space for 18 generating units of 105,000 kw. capacity each will be provided.

The aggregates specifications of the U. S. Bureau of Reclamation require only five sizes of material for a wide range of types of concrete. Coarse aggregate must be in four sizes between 6 in. and $^3/_{16}$ in. on $^3/_{16}$-, $^3/_4$-, $1^1/_2$- and 3-in. square or equivalent round openings. Concrete sand must have a fineness modulus of not less than 2.50 or more than 3.00.

The concrete ranges from an unexposed mass using 6-in. maximum aggregate with a minimum cement content of 1 bbl. per cu. yd., maximum water-cement ratio of 1.0 by volume and minimum compressive strength of 2,800 lb. to reinforced concrete with a $^3/_4$-in. maximum aggregate, cement content of $1^1/_2$ bbl. per cu yd., water-cement ratio of 0.9 by volume and minimum compressive strength of 3,000 lb.

The cement to be used is a modified Type B cement similar to that used at Norris and Wheeler dams by the Tennessee Valley Authority.

The specifications further require that "sand particles shall be hard, dense, durable, uncoated, nonorganic rock fragments that will pass a $^3/_{16}$-in. square or equivalent round opening. It shall be free from injurious amounts of dust, lumps, soft or flaky particles, shale, alkali, organic matter, loam, mica or other deleterious substances."

The aggregate plant at Grand Coulee Dam with the dam and Mason City in the background. At the left is the long conveyor system to the main storage. Beyond that is the west cofferdam and the conveyor system which disposes of the material excavated at the dam site. To the right of the plant are the three clarifiers and behind those is the waste-disposal system.

One of four tractor and scraper units removing overburden from the deposit.

The 4-cu. yd. electric shovel loading to pendulum conveyor at the gravel pit.

The water used in mixing must contain less than 1,000 parts of suspended solids per 1,000,000 parts of water. Concrete must be placed at temperatures between 40 and 100 deg. F. and must be maintained over 40 deg. for not less than 72 hr. after placing or until hardened.

In the design and location of the aggregate plant many factors had to be taken into consideration. The site chosen has many natural advantages which outweighed its disadvantages. The plant is located about 1½ mi. downstream from the dam and on the slope of the hill of glacial deposit on the east side of the Columbia River. This location made possible the utilization of gravity flow through the entire operation from the pit through the screening plant. In this part of the operation the only mechanical handling done is that performed by horizontal belt-conveyors. All other handling about the plant is done by belt-conveyors. Their employment makes possible the further use of gravity in transporting the aggregates from the plant storage-piles to the main aggregate piles. Regenerating of current by these conveyor motors is an added economy.

The maximum concreting schedules on the date on which the designing of the plant was begun called for an average production of 750 tons per hr. of finished aggregates. To take care of peak loads the design was based on a capacity of 1,000 tons per hr., which is now the maximum concreting schedule. This production, it is estimated, will keep seven of the eight 4-cu.yd. concrete mixers supplied.

With an average of 65 per cent. of sand in the pit and a requirement of only 28 per cent. in the concrete mix provision for the disposal of a large volume of waste had to be considered. As this could not be wasted in the river it was decided to dewater the waste sand, thus saving the valuable water which would otherwise have been lost. Just below the plant on a comparatively level area storage was provided for the disposal of about 13,000,000 cu. yd. of fines, an amount exceeding the total amount of material to be used in the construction of the dam. The decision to use clarifiers to salvage the water overflowed from the sand dewaters and classifiers followed logically. The use of wet screening also required less screen area than would have been needed for dry screening and resulted in a much cleaner plant. The fact that the moisture content of the pit material during wet seasons would be too high for efficient dry screening was an added factor. No provision for scrubbing was made because of the absence of clay in the deposit.

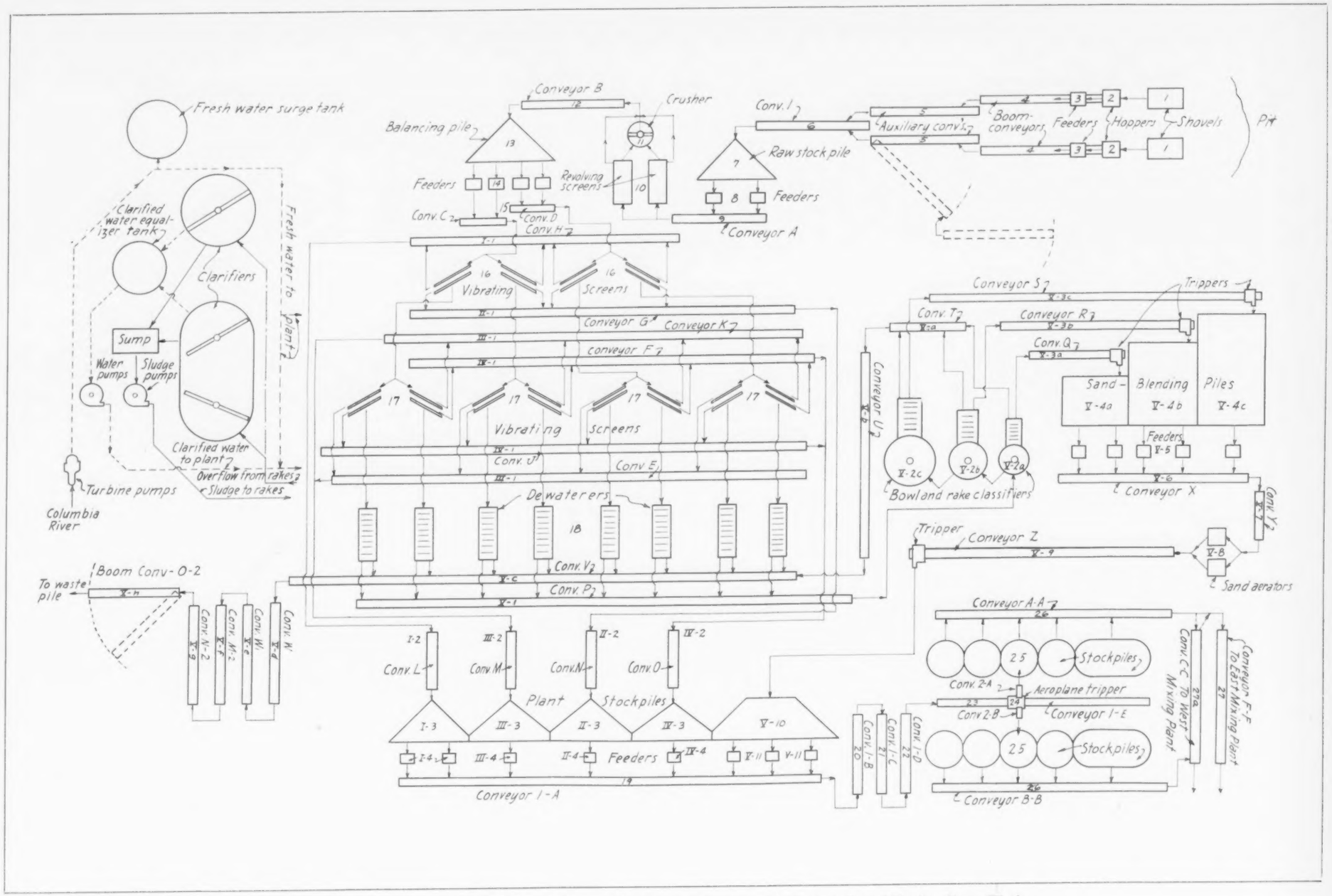
The system of grouping the screens on two floors of the screen building and all the collecting conveyors on a single lower floor and the use of "lowering ladder" chutes helped to make the plant compact and to save in the construction cost.

After the four sizes of coarse aggregate and the sand are separated in the screening building they are not recombined until batched to the concrete mixers. This system prevents any segregation in stock-piling or other handling and insures a uniform mix. The process used for classifying and reblending the sand also makes possible a close control of the fineness modulus.

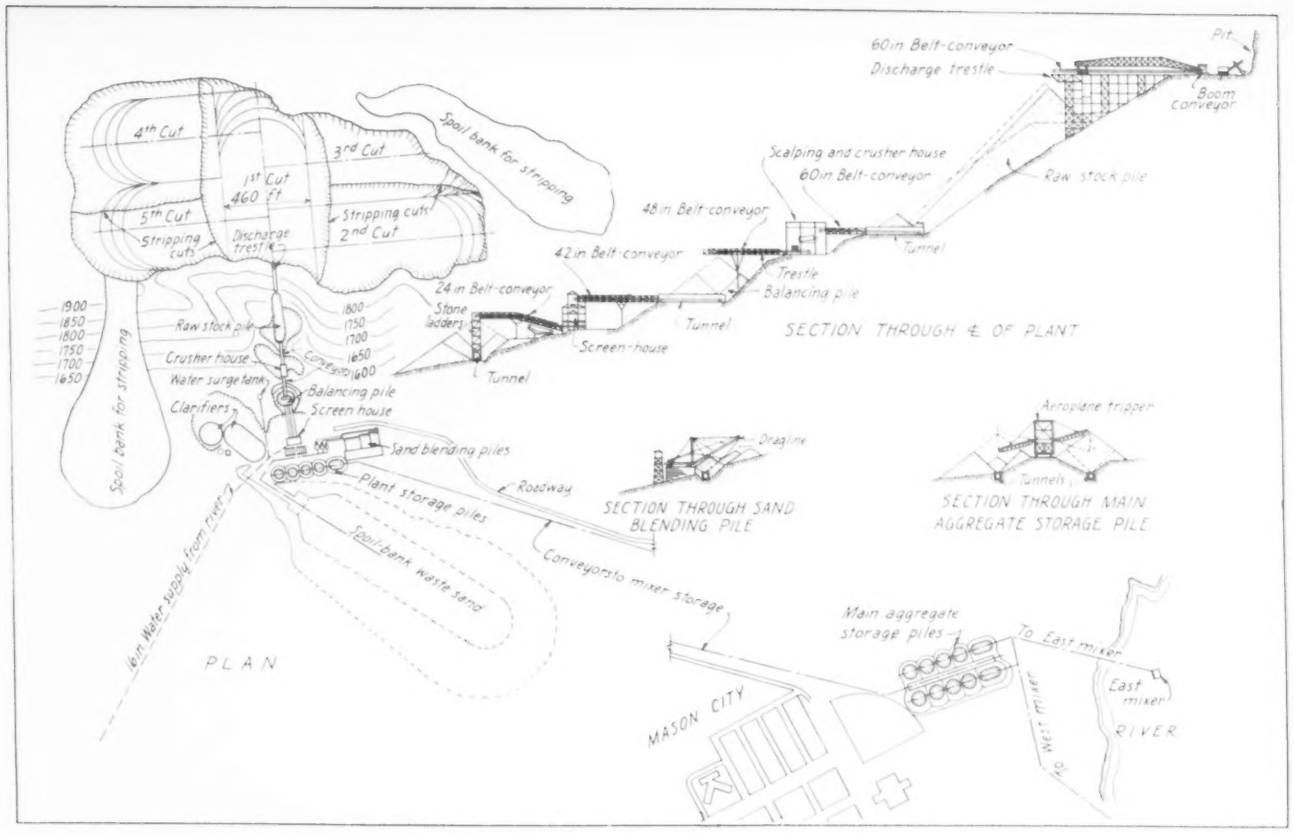
The use of the aëroplane tripper made a compact main storage yard possible. Its use also eliminated the necessity of either an extensive system of low discharge trestles or of rescreening the aggregates to remove material broken in stock-piling. The combined storage capacity at the aggregate plant and the main storage yard is enough to supply both mixing plants for about 3½ days.

Material is obtained from what is known as the

Some of the Diesel-electric locomotives used in placing the concrete.

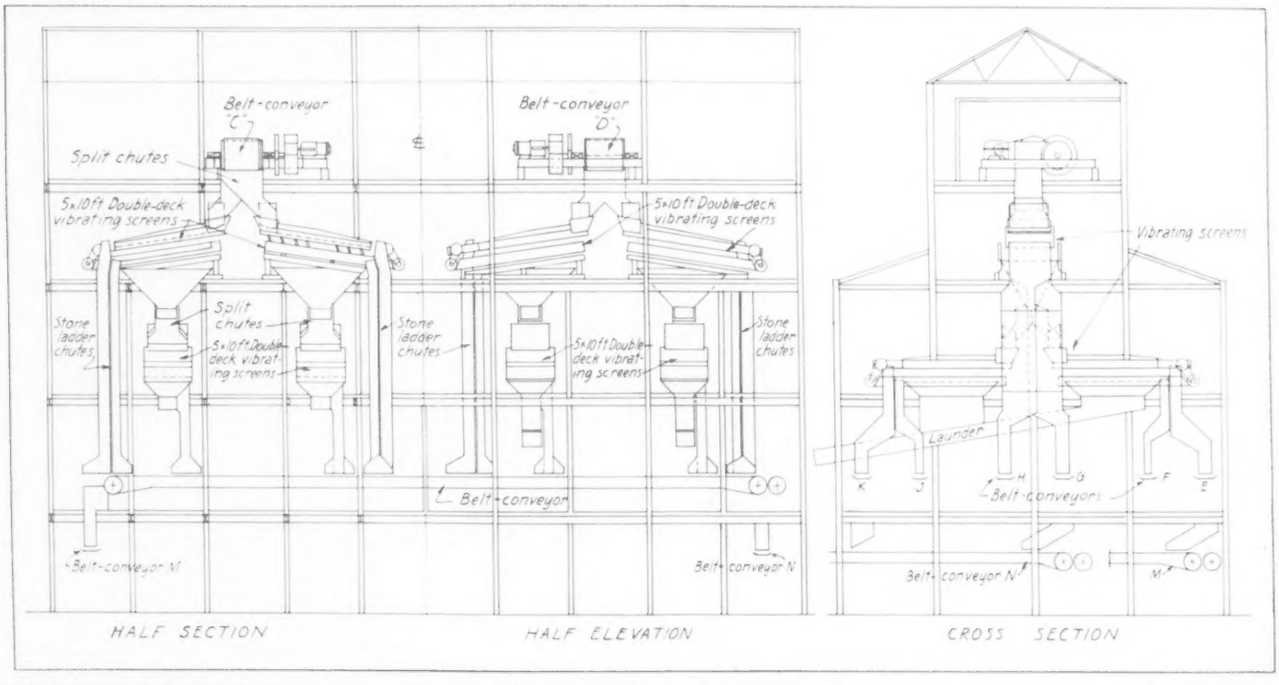


Flow-sheet of the Mason, Walsh, Atkinson, Kier Co. sand-and-gravel plant at Grand Coulee Dam, Wash.



General lay-out of the deposit, aggregate plant and the conveying systems to the main storage piles and to the two concrete-mixing plants.

Brett deposit. It is a glacial deposit created by the reduction of granitic and basaltic rocks. A peculiarity is the absence of any visible mica in the granite. It is located 1½ mi. northeast of the dam site over 900 ft. above the river and about 400 ft. above the plant site. The deposit is fairly uniform with respect to fine and coarse material but has an excessive amount of extremely fine sand in some places and of coarse sand in others. The proportion of sand runs between 60 and 70 per cent. and in some places from 12 to 15 per cent. of all material is minus 100 mesh. The percentage of material that will not pass a 6-in. screen is about 4 per cent. of which about one-fourth is rejected at the pit.



Side and end elevations of the screening building showing the 12 sizing screens, feed and collecting conveyors and stone ladder chutes.

TABULAR ANALYSIS OF OPERATIONS AND EQUIPMENT OF THE MASON, WALSH, ATKINSON, KIER CO. SAND-AND-GRAVEL PLANT AT GRAND COULEE DAM, WASHINGTON—Part I.

(Key numbers refer to corresponding numbers on accompanying flow-sheet.)

Operation	Key	Equipment	Make	Model No., Size, Capacity or Type	Power Source	Power Transmission
Stripping		Tractors (4)	Caterpillar	Diesel 75		
		Scrapers (6)	LeTourneau	12-cu.yd. Carryall type		
		Angledozer	LeTourneau			
Excavating and Transporting to Raw-Material Stock-pile	1	Shovels (2)	Marion	4-cu.yd. electric, Ward-Leonard control		
	2	Pendulums (2)	Jeffrey-Traylor			
		Hoppers (2)				
		Crawlers (4)	Koehring		7½-hp. Westinghouse (4)	Western gear reducers
	3	Feeders (2)	Jeffrey-Traylor	48-in. by 90-in. electric vibrating		
	4	Boom conveyors (2)	Jeffrey	Belt, each 42-in. by 195-ft.	75-hp. Westinghouse (2)	
	5	Auxiliary conveyors (2)	Jeffrey	Belt, each 42-in. by 650-ft.	125-hp. Westinghouse motors (2)	
	6	Main Conveyor No. 1	Jeffrey	Belt, 60 in. by 1,000 ft.	125-hp. Westinghouse motor	
Raw-Material Storage and Reclamation	7	Stock-pile				
	8	Feeders (2)	Jeffrey-Traylor	48-in. by 96-in. electric vibrating		
	9	Conveyor A	Jeffrey	Belt, 60-in. by 165-ft.	50-hp. Westinghouse motor	V-belt
Scalping and Crushing	10	Scalping screens (2) (Oversize to 11, minus 7½-in. to 12)	Allis-Chalmers	Revolving, 72-in. by 22-ft.	50-hp. Allis-Chalmers motors (2)	Allis-Chalmers Texrope
	11	Crusher	Telsmith	Gyratory, 20-in. Type B	125-hp. Westinghouse motor	Goodyear V-belt
	12	Conveyor B	Jeffrey	Belt, 48-in. by 146-ft.	30-hp. Westinghouse motor	
Storage of Minus 6-in. Raw Material	13	Balancing stock-pile				
	14	Feeders (4)	Jeffrey-Traylor	42-in. by 60-in. electric vibrating		
	15	Conveyors C and D	Jeffrey	Belt, each 42-in. by 243-ft.	25-hp. Westinghouse motors (2)	
First Sizing	16	Screens (4) (3- to 6-in. to I-1, 1½ to 3-in. to II-1, minus 1½-in. to 17)	Symons	5-ft. by 10-ft. double-deck	7½-hp. Westinghouse motors (4)	Gates V-belts
Conveying to Storage: 3-in. to 6-in.		(From 16)				
	I-1	Conveyor H	Jeffrey	Belt, 24-in. by 138-ft.	5-hp. Westinghouse gear motor	
	I-2	Conveyor L	Jeffrey	Belt, 24-in. x 156-ft.	10-hp. Westinghouse motor	
	I-3	Stock-pile				
	I-4	Gates (2) (To 19)		Air-operated		
Conveying to Storage: 1½-in. to 3-in.		(From 16)				
	II-1	Conveyor G	Jeffrey	Belt, 24-in. by 66-ft	5-hp. Westinghouse gear motor	
	II-2	Conveyor N	Jeffrey	Belt, 24-in. by 162-ft.	10-hp. Westinghouse motor	
	II-3	Stock-pile				
	II-4	Gate (To 19)		Air-operated		
Second Sizing	17	(From 16) Screens (8) (¾ to 1½-in. to III-1, No. 4 to ¾-in. to IV-1, minus No. 4 to 18)	Symons	5-ft. by 10-ft., double deck	7½-hp. Westinghouse motors (8)	Gates V-belts
Conveying to Storage: ¾-in. to 1½-in.		(From 17)				
	III-1	Conveyors E and K	Jeffrey	Belt, each 24-in. by 64-ft.	5-hp. Westinghouse gear motors (2)	
	III-2	Conveyor M	Jeffrey	Belt, 24-in. by 175-ft.	10-hp. Westinghouse motor	
	III-3	Stock-pile				
	III-4	Gate (To 19)		Air-operated		
Conveying to Storage: No. 4 to ¾-in.		(From 17)				
	IV-1	Conveyors F and J	Jeffrey	Belt, each 24-in. by 130-ft.	5-hp. Westinghouse gear motors (2)	
	IV-2	Conveyor O	Jeffrey	Belt, 24-in. by 171-ft.	10-hp. Westinghouse motor	
	IV-3	Stock-pile				
	IV-4	Gate (To 19)		Air-operated		
Sand Dewatering	18	(From 17) Sand drags (8) (Sand to V-1, waste to Vc, overflow to clarifiers)	Jeffrey	10-ft. by 40-ft. flights	60-hp. Westinghouse gear motors (2)	Drive shaft, clutches and chain
Classification of Sand Fractions: No. 4 to No. 20		(From 18)				
	V-1	Conveyor P	Jeffrey	Belt, 36-in. by 227-ft.	30-hp. Westinghouse gear motor	
		(From V-1)				
	V-2a	Classifier, Bowl	Dorr	13-ft. diameter	3-hp. Sterling motor	Sterling Vari-Drive
		Rake	Dorr	8-ft. by 35-ft.	20-hp. Westinghouse motor	Reeves variable speed drive
		(Waste to Va, overflow to V-2b)				
	V-3a	Conveyor Q	Jeffrey	Belt, 24-in. by 190-ft.	15-hp. Westinghouse gear motor	
		Tripper				
	V-4a	Storage (to V-5)				
Classification of Sand Fractions: No. 20 to No. 48		(From V-2a)				
	V-2b	Classifier Bowl	Dorr	16-ft. diameter	3-hp. Sterling motor	Sterling Vari-Drive
		Rake	Dorr	8-ft. by 35-ft.	15-hp. Westinghouse motor	Reeves variable speed drive
		(Waste to Va, overflow to V-2c)				
	V-3b	Conveyor R	Jeffrey	Belt, 24-in. by 274-ft.	15-hp. Westinghouse gear motor	
		Tripper				
	V-4b	Storage (To V-5)				

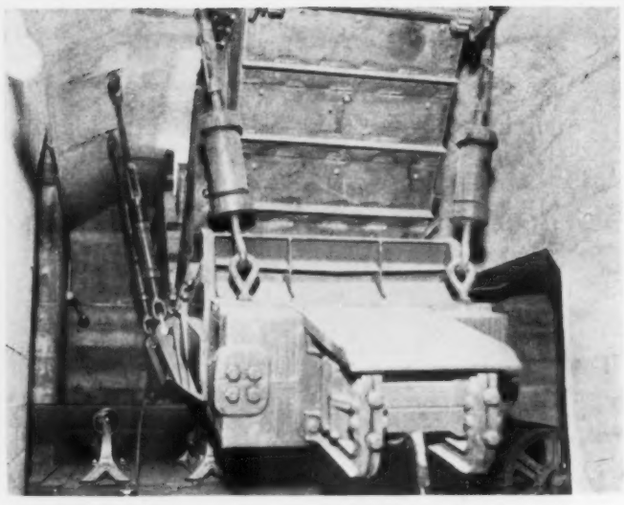
(*Continued on page 55*)

TABULAR ANALYSIS OF OPERATIONS AND EQUIPMENT OF THE MASON, WALSH, ATKINSON, KIER CO. SAND-AND-GRAVEL PLANT AT GRAND COULEE DAM, WASHINGTON—Part II.

(Key numbers refer to corresponding numbers on accompanying flow-sheet.)

Operation	Key	Equipment	Make	Model No., Size, Capacity or Type	Power Source	Power Transmission
Classification of Sand Fractions — No. 48 to No. 100		(From V-26)				
	V-2c	Classifier Bowl	Dorr	25-ft. diameter	3-hp. Sterling motor	Sterling Vari-Drives
		Rake (waste to Va, overflow to clarifiers)	Dorr	6-ft. by 39-ft. 6-in.	10-hp. Westinghouse motor	Reeves variable-speed drive
	V-3c	Conveyor S	Jeffrey	Belt, 24-in. by 344-ft.	15-hp. Westinghouse gear-motor	
		Tripper				
	V-4c	Storage (To V-5)				
Sand Transfer		Dragline Hoist	Washington Iron Works		7½-hp. G. E. 125-hp. Westinghouse motor	Western gear reducer Gear
		Bucket		2½-cu. yd.		
Conveying to Storage		(From V-4a, V-4b, V-4c)				
	V-5	Feeders (5)		Belt type		Reeves variable-speedd rives (3)
	V-6	Conveyor X	Jeffrey	Belt, 36-in. by 185-ft.	10-hp. Westinghouse gear-motor	
	V-7	Conveyor Y	Jeffrey	Belt, 36-in. by 81-ft.	15-hp. Westinghouse gear-motor	
	V-8	Aërators (2)	Jeffrey	Foundry sand mixers		
	V-9	Conveyor Z	Jeffrey	Belt, 36-in. by 310-ft.	30-hp. Westinghouse gearmotor	
		Tripper				
	V-10	Sand Stock-pile				
	V-11	Gates (3) (To 19)		Air-operated		
Conveying from Plant Storage to Main Storage		(From I-4, II-4, III-4, IV-4 and V-11)				
	19	Conveyor 1-A	Jeffrey	Belt, 42-in. by 440-ft.	125-hp. Westinghouse motor	Goodyear V-belt
	20	Conveyor 1-B	Jeffrey	Belt, 48-in. by 2,157-ft.	125-hp. Westinghouse slip-ring motor	Goodyear V-belt
	21	Conveyor 1-C	Jeffrey	Belt, 48-in. by 1,715-ft.	125-hp. Westinghouse slip-ring motor	Goodyear V-belt
	22	Conveyor 1-D	Jeffrey	Belt, 48-in. by 1,068-ft.	125-hp. Westinghouse slip-ring motor	Goodyear V-belt
	23	Stacker Conveyor I-E	Jeffrey	Belt, 42-in. by 629-ft.	125-hp. Westinghouse motor	Tandem pulley drive
		Tripper Stacker	Jeffrey		Westinghouse motor	
	24	Boom Conveyors 2-A and 2-B	Jeffrey	Belt, ea. 42-in. by 75-ft.	40-hp. Westinghouse gear-motors (2)	
	25	Stock-piles				
Reclamation from Main Storage	26	Conveyor AA (To 27)	Jeffrey	Belt, 36-in. by 598-ft.	40-hp. Westinghouse motor	Worthington belt
		Conveyor BB (To 27a or 27)	Jeffrey	Belt, 36-in. by 607-ft.	50-hp. Westinghouse motor	Worthington belt
Transportation to East Mixing Plant	27	(From 27) Conveyor FF (To east mixing plant)	Jeffrey	Belt, 36-in. by 750-ft.	25-hp. Westinghouse motor	Worthington V-belt
Transportation to West Mixing Plant		(From 27)				
	27a	Conveyor CC	Jeffrey	Belt, 36-in. by 680-ft.	25-hp. Westinghouse motor	Worthington V-belt
	27b	Conveyor DD	Jeffrey	Belt, 36-in. by 1,860-ft.	125-hp. Westinghouse motor	Worthington V-belt
	27c	Conveyor EE (To west mixing plant)	Jeffrey	Belt, 36-in. by 1,352-ft.	125-hp. Westinghouse motor	Worthington V-belt
Waste-Sand Disposal		(From V-2a, V-2b, V-2c)				
	V-a	Conveyor T	Jeffrey	Belt, 24-in. by 105-ft.	10-hp. Westinghouse gear-motor	
	V-b	Conveyor U	Jeffrey	Belt, 24-in. by 53-ft.	10-hp. Westinghouse gear-motor	
		(From V-b, 18, and sludge pumps through 18)				
	V-c	Conveyor V	Jeffrey	Belt, 42-in. by 155-ft.	30-hp. Westinghouse motor	
	V-d	Conveyor W	Jeffrey	Belt, 42-in. by 193-ft.	30-hp. Westinghouse motor	
	V-e	Conveyor W-1	Jeffrey	Belt, 42-in. by 400-ft.	125-hp. Westinghouse motor	
	V-f	Conveyor M-2	Jeffrey	Belt, 48-in. by 465-ft.	125-hp. Westinghouse motor	
	V-g	Conveyor N-2	Jeffrey	Belt, 48-in. by 144-ft.	100-hp. Westinghouse motor	
	V-h	Stacker Conveyor O-2	Jeffrey	Belt, 48-in. by 150-ft.	75-hp. Westinghouse motor	Internal drive
		Crawlers (2) (To waste pile)	Bucyrus-Erie		7½-hp. Westinghouse motors (2)	Western gear reducers (2) and chain
Fresh-Water Supply		(From River) Pumps (2)	Worthington	Deep-well type, 8-stage turbine	500-hp. Westinghouse motors (2)	Direct-connected
		(To Plant)				
Water Reclamation		(From 18, V-2a, V-2b, V-2c)				
		Clarifiers (3)	Dorr	125-ft. dia., center pier type	Two 5-hp., one 3-hp. Westinghouse motors	Falk vertical gear-reducers
		(Water to top of screen house; sludge to 18)				
		Tank		130,000-gal. capacity		
		Pumps (3) (To plant)	Worthington	Centrifugal, 6,000 gal. per min.	300-hp. Westinghouse motors (3)	Direct-connected
Sludge Handling		Pumps (3) (To 18)	Kimball-Krogh	Centrifugal, 6-in.	50-hp. Westinghouse motors (3)	Direct-connected

One of two pairs of vibrating feeders discharging from balancing pile to one of the two conveyors to screening building.



One of the two 42-in. by 60-in. vibrating feeders showing shock-absorbing type of suspension and vibrating mechanism.

The deposit averages about 80 ft. in depth and all the aggregates for this contract will be secured from it. Below this deposit is a layer of very fine sand from 15 to 25 ft. thick below which is another gravel deposit from 125 to 150 ft. deep with an ample amount of material for the completion of the high dam.

The overburden consisted of about 3 ft. of fine soil with a light growth of sage and greasewood. This was removed by three Caterpillar Diesel "75" tractors each pulling two 12-cu.yd. LeTourneau "Carryall" scrapers in tandem. This material is so fine that on a windy day the lack of visibility made it necessary to stop stripping operations. The material was deposited near one end of the pit and another Caterpillar tractor with a LeTourneau angledozer leveled out the dump by pushing the waste over the brink of the hill. About 385,000 cu.yd. of stripping has been removed.

The material will ultimately be excavated by two 4-cu.yd. Marion electric shovels equipped with Ward-Leonard control. These will discharge it into hoppers at the feed ends of two 42-in. pendulum conveyors 200 ft. in length carried on steel booms. Grizzly bars spaced 16 in. apart over the hoppers will reject bowlders too large to be handled by the conveyor system. These grizzlies are comparatively flat in order to give sufficient head room for the shovels. They are hinged at one end and are fitted with oil cylinders so that they can be dumped when necessary. Under each hopper is a 48-in. by 90-in. Jeffrey-Traylor vibrating feeder. The receiving end of each pendulum is pivotally supported on a truck having two Koehring crawler treads independently motor-driven. The discharge ends of the pendulum conveyors will be pivotally supported on cars that straddle two 42-in. collecting conveyors each 650 ft. long. The collecting conveyors will in turn discharge to the main 60-in. stationary discharge conveyor (No. 1) which will ultimately be 1,000 ft. in length.

At present only one shovel and one pendulum conveyor are in use, the latter being pivoted from the main discharge conveyor. Cuts are being made directly across the pit to a width of about 460 ft. As the shovel advances the pivot end of the pendulum conveyor moves forward along the discharge conveyor. When operations have advanced about 200 ft., one of the north or south extensible branch conveyors may be installed and the second shovel and pendulum conveyor started working into the deposit at right angles to the main conveyor. This will allow full-capacity operation of the plant to be maintained. It is expected that the first shovel and pendulum will continue the 460-ft. wide cut across the deposit with the main conveyor being extended to an ultimate length of 1,000 ft. This shovel and pendulum will then work with the second collecting conveyor on another cut at right angles to the main conveyor but on the opposite side.

With this system it will be possible to maintain the maximum output of the shovels as each shovel will work on a semi-circular face and will be closely followed by the pendulum hopper so that the shovel swing for each dipper load will be only about 90 deg. After each 180-deg. swing of the pendulum it and the shovel will advance in the direction of the cut, a distance regulated by the reach of the shovel, and a reverse swing started. When necessary, each of the collecting conveyors will be extended as was the main conveyor.

The first cut is being worked to a depth of about 45 ft. When the material on this level is exhausted the 60-in. main conveyor will be reinstalled at a lower level and the same excavating and handling procedure followed.

The main belt-conveyor (No. 1), which is supported on a timber trestle, discharges its load on a large raw-material stockpile that gives a balancing effect between the pit and the crusher building. This stock-pile has a capacity of about 300,000 tons, of which about 100,000 tons is live storage. Underneath the stock-pile is a concrete chamber housing two 48-in. by 96-in. Jeffrey-Traylor feeders having individual hopper openings. These deliver material to 60-in. by 165-ft. conveyor A, which carries the material to the crusher building. That part of the reclaiming conveyor under the stock-pile is housed

in a tunnel of laminated-wood construction.

The material is split to two 72-in. by 22-ft. Allis-Chalmers revolving scalping screens fitted with ¾-in. thick cast manganese-steel plates having 7½-in. round openings. These scalp the plus 6-in. material to a 20-in. Type B Telsmith gyratory crusher set to reduce the material to minus 6 in. This eliminates recirculating loads. The minus 6-in. material from the screens and the product of the crusher join on conveyor B, which is 48 in. wide and 146 ft. long. Material is discharged from this conveyor to another balancing stock-pile which has sufficient capacity for over two hours' operation of the main preparation plant.

Under this stock-pile is another concrete chamber with four openings for the two pairs of 42-in. by 60-in. Jeffrey-Traylor feeders. Each pair of feeders discharges to one of the two twin conveyors (C and D) leading to the main plant. Each of these conveyors is 42 in. wide and 243 ft. long and is protected under the stock-pile by a laminated-timber tunnel.

Conveyors C and D enter the main building on the fourth floor. Each one delivers to a hopper and through split chutes to two Symons screens on the floor below. These four screens are 5-ft. by 10-ft. two-deck units with 3-in. by 1½-in. mesh wire cloth. A large jet of reclaimed or clarified water strikes the material as it leaves each of the conveyors and additional clarified water is applied to the first half of each screen through 6 Binks spray nozzles. A portion of the fresh or make-up water from the river is applied through 6 additional Binks nozzles to the discharge ends of the screens to give the gravel a final rinsing. This system prevents dirty material leaving these screens in case of a failure of either source of water supply or in case the clarifiers should at any time fail to give satisfactory wash water.

The two sizes of gravel removed by these screens —6-in. to 3-in. and 3-in. to 1½-in.—are delivered through lowering ladders to collecting conveyors H and G, respectively, on the first floor of the building. These conveyors are 24 in. wide and, respectively, 138 ft. and 66 ft. long.

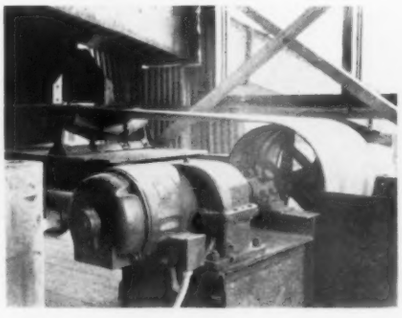
The minus 1½-in. material and the water from each of the first four Symons screens is split to two Symons screens on the second floor. These eight screens are also 5-ft. by 10-ft. double-deck units and each has ¾-in. and No. 4 wire cloth. Both clarified and fresh water are also applied to these screens through 12 Binks spray nozzles on each. The 1½-in. to ¾-in. and the ¾-in. to No. 4 products of these screens are delivered through lowering ladder chutes to their respective 42-in. collecting conveyors K, E and F, J on the floor below. Conveyors K and E are 64 ft. long and conveyors F and J are 130 ft. long.

The six collecting conveyors deliver the sized materials to four 42-in. stock-piling conveyors placed at right angles. Conveyor H discharges to 156-ft. conveyor L, conveyor G to 171-ft. conveyor O, conveyors K and E to 175-ft. conveyor M, and conveyors F and J to 162-ft. conveyor N. These materials are delivered from the stock-piling conveyors through lowering ladders to their respective piles over the plant storage tunnel.

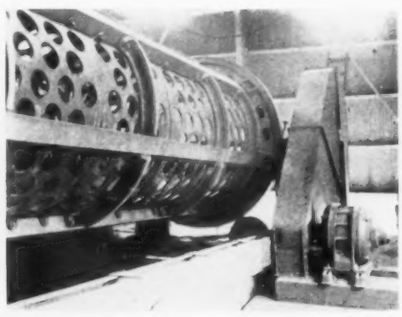
All the fines passing the No. 4 decks of the eight final screens are carried by the wash water through launders to the settling basins of eight Jeffrey drag-type sand dewaterers. These are arranged in a single row between and paralleling the main building and the plant stock-piles. Each set of 8 drags is independently driven by a single motor through a drive shaft and chain and each pair of drags has a separate clutch. The water and minus 100-mesh sand overflows into a launder which discharges to the clarifiers. The dewatered sand is delivered to two belt-conveyors, P and V, under the discharge lips of the dewaterers. The sand may be divided in any desired proportion between these two conveyors by means of 4-way split chutes on each dewaterer. Conveyor V is the first of a series of conveyors for the disposal of excess sand.

Conveyor P, which carries the sand from the dewaterers to the three Dorr bowl classifiers operating in series, is 36 in. wide and 227 ft. long. A sufficient amount of sand is diverted from the dewaterers to the classifiers to supply the requirements for that class of sand of which there is the least percentage in the pit run. Using this method there will be additional waste to be taken back to the waste dump along with the sand wasted at the dewaterers.

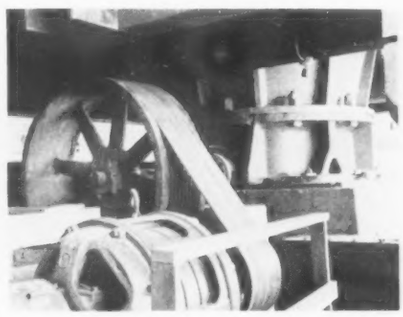
The first of the three Dorr classifiers has a 13-ft. diameter bowl and an 8-ft. by 35-ft. rake. Sufficient water is added here to control the classifying action. The minus 20-mesh material overflows into the second classifier, which has a 16-ft. diameter bowl and



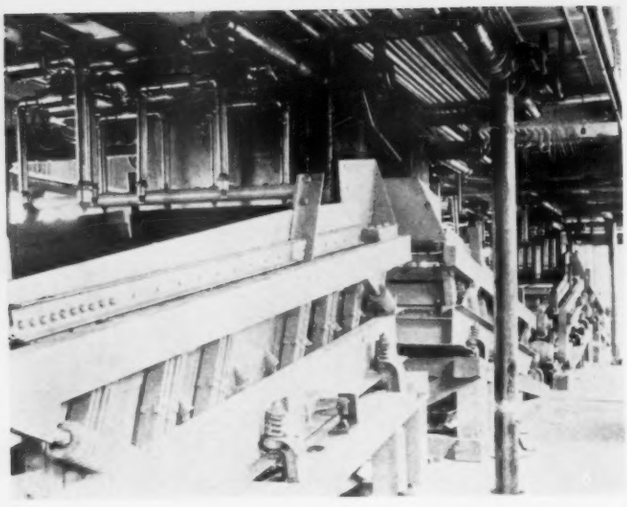
Motor-reducer drive of one of the belt-conveyors in the screening building.



Inclosed V-belt drive of one of the two 6-ft. by 22-ft. revolving scalping screens.



Motor and V-belt drive of the gyratory crusher which does all reduction.



Four of the eight 5-ft. by 10-ft. double-deck final-sizing screens with spray nozzles.

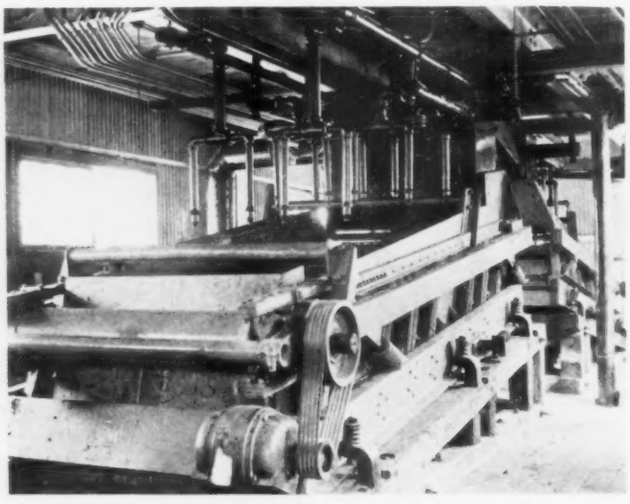
an 8-ft. by 35-ft. rake. The minus 48-mesh material overflows into the third classifier, which has a 25-ft. diameter bowl and a 6-ft. by 39½-ft. rake. The water and minus 100-mesh material overflowing the third classifier are flumed to the clarifiers. Each classifier bowl and rake is independently driven through variable-speed drives, Reeves variable-speed transmissions being used on the rakes. Clear water is also applied at the classifier rakes for a final rinse.

Two-way split chutes allow the discharge of any desired amount of any of the three sizes of dewatered sand from the classifier rakes to belt-conveyor T. This 24-in. by 105-ft. conveyor feeds a 24-in. by 53-ft. cross conveyor U, which discharges on conveyor V that collects waste from the sand dewaterers. The required proportion of the three sizes of sand from the classifiers is discharged to three 24-in. stockpiling belt-conveyors. The 4- to 20-mesh material from the first classifier is discharged to 190-ft. conveyor Q, the 20- to 48-mesh material from the second classifier to 274-ft. conveyor R and the 48- to 100-mesh material from the third classifier to 344-ft. conveyor S.

Automatically-reversing traveling trippers on each of these conveyors spread the sand in thin layers across the full width of three side-hill drainage bins with open-joint tile underdrains which further dewater the sand. The spreading of the sand in this manner evens out the effects of any changing conditions in the classifiers. These stock-piles have a combined capacity of about 25,000 tons.

After the sand has drained sufficiently a traveling dragline derrick handling a 2½-cu.yd. scraper bucket moves it over a reclaiming tunnel. Five belt-feeders, one under the fine-sand pile and two under each of the other piles, mix the three sizes of sand to specification on 36-in. by 185-ft. tunnel belt-conveyor X. These feeders are driven through Reeves variable-speed transmissions. A 36-in. by 81-ft. cross belt-conveyor, Y, carries the sand to two Jeffrey foundry-sand mixers. These discharge the thoroughly mixed and aërated sand to stock-piling belt-conveyor Z, which is 36 in. wide and 310 ft. long. A traveling tripper beds the sand in layers in a storage pile over the main plant storage tunnel, which also serves the four coarse-aggregate stock-piles.

Waste-collecting conveyor V is 42 in. wide and 155 ft. long and will ultimately feed at about right angles to conveyor W, which will be 42 in. wide and 193 ft. long. Conveyor W will feed extension conveyor W-1, which will be 42 in. wide and 400 ft. long. This will be the last of the stationary conveyors in this system. Conveyor W-1 will feed 48-in. conveyor M-2, which is known as the stacker extension section and will be 465 ft. long when fully extended. This conveyor is so designed that the following conveyor, N-2, known as the stacker telescoping section, can be telescoped under it for a distance of 49 ft., equal to the length of the sections added to conveyor M-2. Conveyor N-2 is 48 in. wide and 144 ft. long. It is followed by stacker boom conveyor O-2, which is 48 in. wide and 150 ft. long.



Two of the four 5-ft. by 10-ft. coarse-sizing screens with V-belt drive in foreground.

Boom conveyor O-2 swings from the end of conveyor N-2, distributing material to the waste pile in arcs of 180 deg. After each swing the telescoping section, N-2, which is on rails, is advanced a short distance until its limit of 49 ft. has been reached. Conveyor M-2 is then pulled ahead this distance and a 49-ft. section added to conveyors W or W-1 until they reach their intended lengths. Further extension of the system is then planned by adding to conveyor M-2. At present it has not yet been necessary to install conveyors W and W-1 and conveyor M-2 is only a fraction of its ultimate length.

Boom conveyor O-2 is pivoted at its feed end and is carried near its discharge end on a crawler frame to which it is connected by a universal joint. This frame has two independently-powered Bucyrus-Erie crawlers.

The two main plant coarse-aggregate stock-piles for the two intermediate sizes have live-storage ca-

pacities for 2,125 tons each and the stock-piles for the coarser and finer sizes have live-storage capacities for 2,340 tons each. The sand stock-pile has a live-storage capacity of about 3,800 tons. These piles are proportioned to have a free-flowing capacity of considerably more than one shift's operation, so that transfer from this storage to the main storage will require handling each size only once during each shift.

The overflow from the sand dewaterers and classifiers is sluiced to three 125-ft.-diameter Dorr clarifiers of the center-pier type. Two of these units are located in one basin and the third unit in another. The clarifier arms are of triangular cross-section and are hinged diagonally in the direction of batter so that any overload tends to drag the tip of the arm backward and upward.

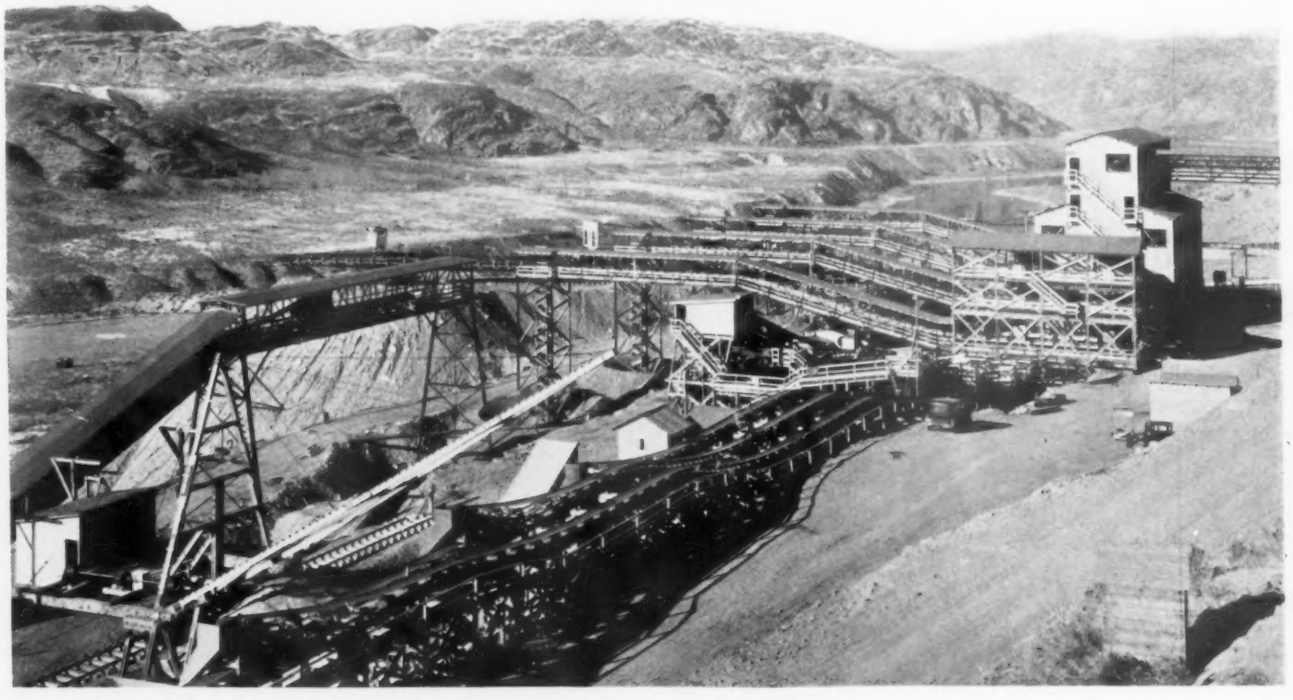
The sludge underflow from the clarifiers was figured at a maximum of 300 tons per hr. with a 50-per cent. concentration. Three Kimball-Krogh 6-in. centrifugal sludge pumps, one of which is a spare, deliver the sludge to the sand dewaterers for draining. This saves valuable water and puts the sludge into condition for handling on the waste-conveyor system.

The maximum flow of water through the plant is expected to be about 20,000 gal. per min. There is little if any clay in the deposit but the large amount of sand requires an unusually large quantity of water. The plant design was based on the above quantity of water with a possible loss in the process and waste sand of 25 per cent. Actual fresh or make-up water pumpage is based on 5,000 gal. per min., while clarifier pumpage is provided for 18,000 gal. per min. to cover possible variations from the assumed loss.

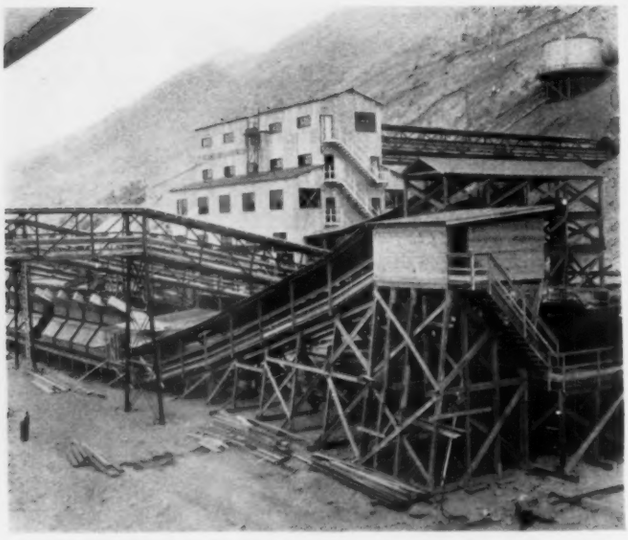
Fresh water is obtained from the Columbia River at a pumping plant located on the end of a wood-pile trestle extending several hundred feet into the river. Two Worthington 8-stage deep-well type turbine pumps, submerged so that they have no suction head, are driven by direct-connected motors at the pumping plant on the 990-ft. level. Space has been left for a third pump. These pumps, during the low water season, lift the water from the river surface at the 937-ft. level to the 1,540-ft. level through a single 16-in. pipe-line against a static head of 603 ft. and a friction head of 70 ft. at the rate of 2,500 gal. per min. each. The water is pumped to a balancing tank of 100,000-gal. capacity at the 1,540-ft. level. From this tank the water is fed by gravity pressure to the plant through a 12-in. line. A check valve cross connection to the 24-in. clarified-water line gives that line a make-up source and the same static head as the clear water at the same time insuring against the entry of clarified water into the fresh water system.

The pipe-lines from the river pumps to the balancing tank are protected against water hammer by relief valves and air chambers. The speed of opening and closing the shut-off valves is controlled by throttling the water supply. A 15-ft. air chamber at the lower end of each line also reduces the hammer. Because of a break downward at one point in the profile of the discharge line, a separation of the column of water is caused at one point. This is protected by an inward-opening check valve to allow entry of an air cushion when the column does separate.

The clear water from the clarifiers overflows into a 130,000-gal. equalizer tank. Three Worthington centrifugal pumps, in the same building with the



Another view of aggregate plant with sand-stockpiling conveyors and dragline in left foreground. Sand-and-gravel stockpiling conveyors and stone ladders in background.



The screening building with sand drags at left and conveyor to sand-classifying equipment in foreground.

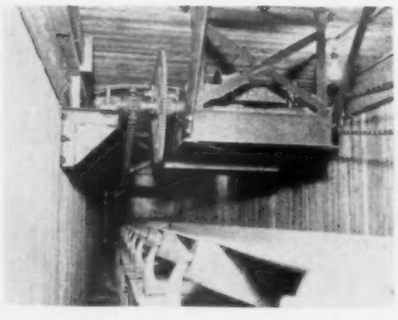
sludge pumps, recirculate the clarified water to the plant through a 24-in. pipe-line. Each of these pumps is rated at 6,000 gal. per min. against a 170-ft. total head. These pumps are controlled manually from the equalizer tank. Space has been left in the pump-house for a fourth clarifier pump should it be found necessary.

The four sizes of coarse aggregate and the sand in the main plant stock-piles are reclaimed through tunnel openings to tunnel belt-conveyor 1-A, which is 42 in. wide and 440 ft. long. There are six openings under the sand stock-pile, two under the cobble pile, and one under each of the other three coarse aggregate stock-piles. The gates under these openings are of the sliding type with adjustable swinging lips operated by double-acting air cylinders. The closing side of each cylinder has a constant pressure of 55 to 60 lb., and the opening side operates on 115- to 125-lb. pressure which is admitted as desired by a solenoid-operated valve controlled by a multiple switch on the aëroplane tripper at the main storage pile. This switch is of the dial-and-pointer type with a separate contact for every gate in the tunnel. This makes it impossible to feed through more than one gate at one time. The high-pressure cylinder, when turned on, opens the gate by pushing the low-pressure air back into the system. The closing of the switch or stoppage of any of the conveyors in the reclaiming system automatically cuts off the high-pressure cylinder, allowing the low-pressure cylinder to close the gate. A limit switch on each gate operated by a finger on the gate makes a contact when the gate is opened to the desired position and lights a signal on a panel on the aëroplane tripper. When the gate closes this light is automatically put out. The low-pressure air cylinder has an outlet cock adjusted so that the gate will open slowly and a check valve to allow quick closing. The hinged gate lip rises out of the way of the material on the belt-conveyor when not in use. A 10-pair electric cable connects these gates with the control switch, and carries the signal line and telephone lines. Air for these gates is supplied by a Gardner-Denver compressor with a capacity of 75 cu.ft. per min.

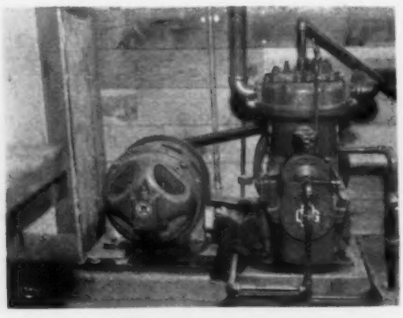
Conveyor 1-A discharges to belt-conveyor 1-B, the first of a series of three 48-in. belt-conveyors connecting the plant stock-piles to the main stock-pile. Conveyor 1-B is 2,157 ft. long, 1-C is 1,715 ft. long and 1-D is 1,068 ft. long. These three conveyors carry the material down hill, having a combined drop of 180 ft. in their total length, and their motors are regenerative when the conveyors are loaded. Each down-hill conveyor is equipped with a G.E. solenoid brake.

Some of the eight drag-type sand dewaterers with feed launders and one of the aggregate-stockpiling conveyors above.

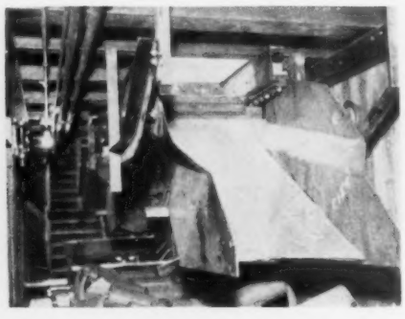
Conveyor 1-D discharges the material to the



One of the sand-tunnel feeders with variable-speed drive.

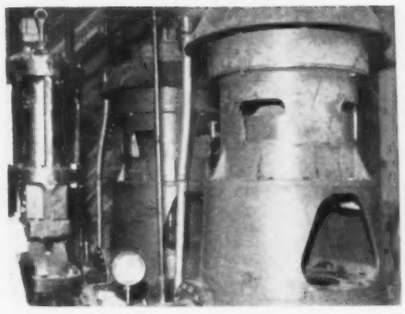


Air compressor which supplies air to operate tunnel gates.

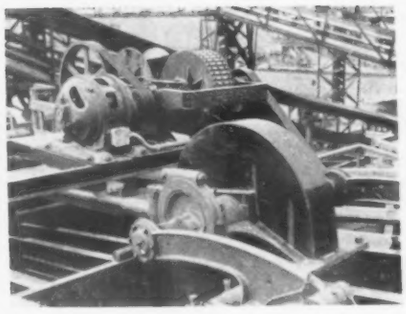


One of the air-operated gates in the aggregate-stockpile tunnel.

The two revolving arms in the large clarifier.



The two turbine pumps which supply water from the river.



Variable-speed drive of rake section of classifier.

aëroplane tripper stacker belt-conveyor, 1-E, which is 42 in. wide and 620 ft. long. This tripper, which was designed and built by the Jeffrey Mfg. Co., derives its name from the resemblance it bears to an aëroplane. It is mounted on rails straddling conveyor 1-E and operates in the same manner as the ordinary small tripper, picking up material from the distributing conveyor to a hopper. The material is distributed laterally to stock-piles on either side by two wing-like conveyors, 2-A and 2-B, each of which is 42 in. wide and 75 ft. long. These lateral conveyors are hinged at the body of the tripper and their outer or discharge ends can be raised or lowered to keep them near the tops of the aggregate piles.

The five sizes of aggregate are handled separately to five piles on each side of the tripper conveyor. The eight coarse-aggregate piles have live storage capacities of 7,000 tons each. The two sand stock-piles have live storage capacities of 10,500 tons each. A system of 14 gates, similar to those in the plant stock-pile tunnel, is used in each of these tunnels. These gates are controlled from multiple switches in the two concrete central-mixing plants. Air for the operation of these gates is supplied by another 75-cu.ft. Gardner-Denver compressor. Ordinarily the east tunnel will supply aggregates for the east mixing plant and the west tunnel for the west mixing plant, each supplying a separate field-conveyor system. Tunnel conveyors AA and BB, respectively, reclaim aggregates from these piles.

Two of the three bowl-and-rake sand classifiers discharging dewatered sand to stockpiling conveyors.

Conveyor AA is 36 in. wide and 598 ft. long and ordinarily feeds conveyor FF, which is 36 in. wide and 750 ft. long. The latter will discharge the material to the east mixing plant when this is built.

Conveyor BB is 36 in. wide and 607 ft. long. It discharges to conveyor CC, which, with conveyors DD and EE, forms a series of three 36-in. conveyors leading to the west mixing plant. Conveyor CC actually extends to the discharge end of conveyor AA so that in an emergency the east stock-pile can supply aggregates for the west mixing plant. Also by reversing conveyor CC the west stock-pile can supply aggregates for the east mixing plant.

Conveyor CC is 680 ft. long and extends to the east bank of the river. Conveyors DD and EE, respectively 1,860 ft. and 1,362 ft. long, carry the material across the river on a 3,500-ft. suspension bridge built especially for this purpose. This bridge has two 1,437-ft. spans and one 420-ft. span. Conveyor EE discharges materials to the west mixing plant.

The aggregate screening plant is heated for cold-weather operation by steam from a 300-hp. oil-burning boiler. About 50 high-pressure unit heaters operating at 100-lb. pressure are distributed about the plant. Steam circulates from the heaters through traps back to a hot well and to the boiler.

The same boiler supplies steam for heating sand and gravel in the sand blending and plant storage piles by means of 2-in. steam lines. At each tunnel feed opening a 1½-in. branch pipe encircles the opening outside and above the tunnel. This pipe has ⅛-in. openings for the release of live steam directly into the aggregate.

Another 300-hp. oil-burning boiler supplies steam in the same manner for the main aggregate-storage tunnels and a third boiler heats the aggregate in the west mixing plant bins. The east mixing plant, when built, will be served by the same boiler as the main storage.

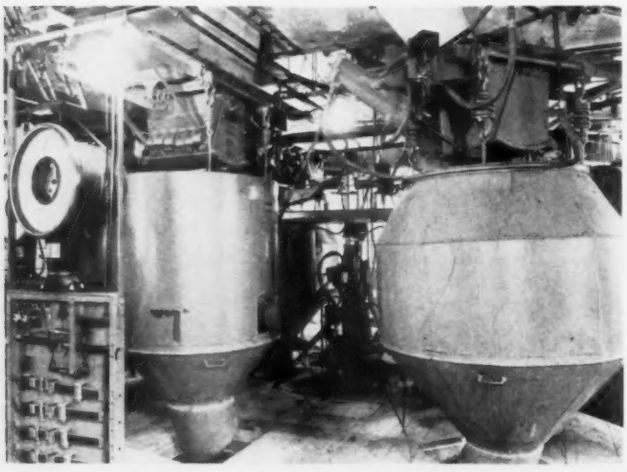
The laminated-wood tunnels under all the stock-piles are an interesting feature of the plant. Both the box and arch sections are made of 4-in. by 8-in. to 4-in. by 12-in. timbers, the larger dimension forming the thickness of the tunnel wall. The box sections were formed by alternately extending the

Aëroplane tripper discharging from two wing conveyors to main stockpiles.

horizontal and vertical segments to form a series of slip-tenon splices at the corners. The arch sections were formed of short tangents with the splices staggered in adjacent laminations. All the timbers were cut, numbered and drilled for nail holes at a mill in Spokane. The erection at the plant site was rapidly and economically accomplished as the numbered pieces needed merely to be set in place and spikes set in the prepared holes and driven into the next lamination with pneumatic hammers.

The power used at the plant and the dam comes from the station of the Washington Water Power Co. at Coulee City over a 30-mi. line at 110,000 v. At the dam site it is reduced to 11,000 v. for distribution to the entire area. Further reduction is made at other stations. Substations at the plant and pit reduce the current to 2,300 v. for the shovels at the pit and to 440 v. for all other motors.

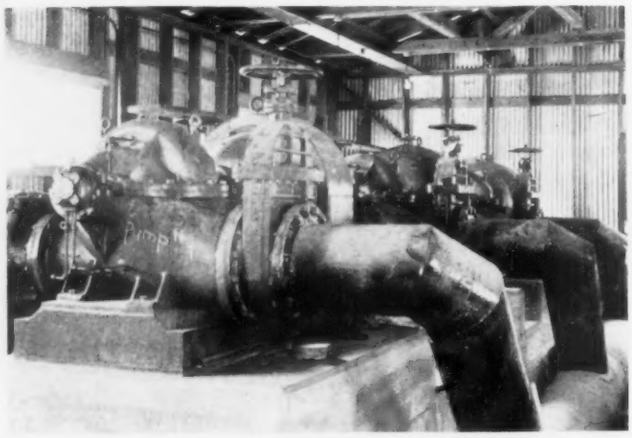
The interlocking electrical control systems at the



Some of the aggregate- and cement-batching equipment in the west mixing plant.

plant are interesting. The first unit is at the pit, where all the motors, except those operating the pendulum-conveyor crawlers, are comparatively large and are of the slip-ring type with magnetic-control panels. Starting of the main gravel-pit cross conveyor 1 automatically starts the preceding conveyors and feeders in sequence. Stoppage of any one motor automatically stops all the motors and the feeders between that point and the shovels.

A second system is in the crusher-house, where the starting of outgoing conveyor B brings in in sequence the crusher, scalping screens, conveyor A and the two feeders under the raw-material stockpile. The stopping of any unit in this group stops everything up to the feeders. The only exception in this automatic sequence is additional control of the two scalping screens by individual push-button switches which allow either screen to be thrown out



The three centrifugal pumps which rehandle clarified water to the plant.

of the interlock circuit for repairs without affecting the remainder of the plant. A start-stop button near each screen allows running it for testing purposes when out of circuit.

The third system includes the entire screening plant, sand dewaterers, sand classifiers, waste-disposal system and all related equipment. A complete interlocked switchboard and master push-button control board are located in a dust-tight control room on the top floor of the screen-house, where the chief operator will be on duty at all times. A combination of automatic and manual control is used.

The first button on the board starts all the waste-disposal conveyors in series from the stacker to the classifiers. When the last of these has come up to speed, the second button will start the three conveyors carrying sand from the classifiers to the drainage bins. The sand classifiers are then started individually by the classifier attendant by buttons alongside each machine. This variation is necessary as it is desirable to watch this type of machine while starting. When the last classifier is in operation the conveyor carrying sand to the classifiers starts automatically and the chief operator starts the sand dewaterers. When these are in operation, another button starts all the gravel conveyors and a final button starts all the screens and the two incoming conveyors back to the feeders. The latter have individual starting buttons.

All the equipment, except the sand classifiers, is so interlocked through the switchboard that the stopping of any unit will cut out all the units from that point back to the feeders under the balancing pile. The classifiers are kept running as restarting

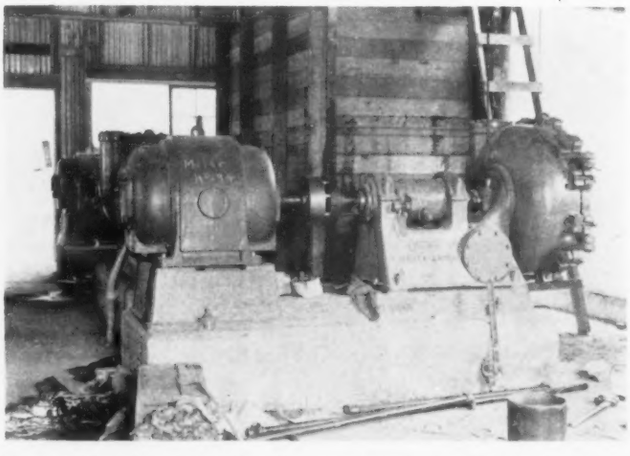
under load is a slow process, and a pile-up of sand on the receiving conveyors is less troublesome.

Multiple units, such as the screens, have buttons on the switchboard which allow cutting any unit out of the system for testing or repairs. A separate control board in the clarifier pump-house controls the clarifier and sludge pumps.

As previously stated, the aëroplane-tripper operator controls the gates in the plant-storage tunnel, and the transfer conveyor line to the main storage. Operators of the two concrete central-mixing plants control the conveyor systems feeding these plants and their respective tunnel conveyors and feeders.

The general design of the aggregate plant was made by engineers on the staff of the Mason-Walsh-Atkinson-Kier Co., under the direction of Francis Donaldson, chief engineer, and C. D. Riddle, job engineer. The entire general lay-out and mechanical design were under the direction of G. F. Dodge, who, with his assistants, R. M. Matthew and C. J. Wheeler, were lent to M. W. A. K. by the Jeffrey Mfg. Co. for this job. S. M. Mercier was sales engineer for Jeffrey. D. O. Nelson was in charge of structural design. All the engineering was done on the job. The plant was erected by the construction department of M. W. A. K. under the direct supervision of E. R. Stokes and the general supervision of Harvey Slocum, general superintendent for M. W. A. K. H. L. Myer is general manager for M. W. A. K. at Coulee Dam.

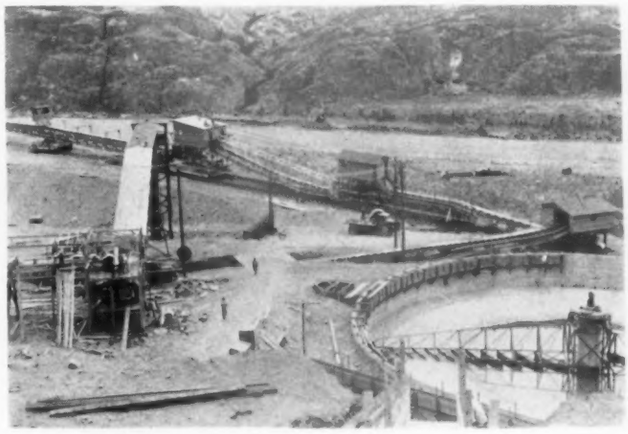
Most of the equipment used in the plant was supplied by the Jeffrey Mfg. Co., including the idlers, pulleys, drive frames and drives of the plant's 48 belt-conveyors, which total nearly 22,000 ft. in length. This company also furnished the 8 Jeffrey-



Two of the three centrifugal pumps which handle sludge from the clarifiers to dewaterers for disposal.

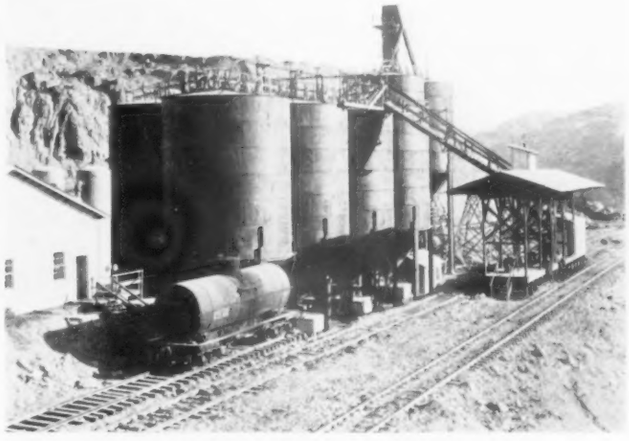
Traylor vibrating feeders, the 16 sand drags, the 4 sand stock-piling trippers, the 5 feeders under the sand-dewatering piles, the 2 sand aërators and the complete aëroplane tripper, the 3-unit waste-sand stacker and the pendulum conveyor units in the pit. The conveyor belting used in this plant was supplied by the Goodyear Tire & Rubber Co., U. S. Rubber Co., Boston Woven Hose & Rubber Co., Mechanical Rubber Products Co., and Pioneer Rubber Co. The equipment in the pit includes two 5-cu.yd. Marion electric shovels, 4 Caterpillar Diesel "75" tractors and 6 Carryall scrapers and an angledozer made by R. G. LeTourneau, Inc.

The Symons Bros. Development Co., Hollywood, Cal., furnished the 12 vibrating sizing screens. The Allis-Chalmers Mfg. Co. supplied the two revolving scalping screens with their motors and V-belt drives. The Westinghouse Electric & Mfg. Co. supplied most of the electric motors, gearmotors and



The waste-disposal system with stacker boom conveyor at left. One of clarifiers is in right foreground.

electrical equipment. The separate gear reducers were furnished by the Western Gear Works, Seattle, Wash. The tunnel gates not credited to other manufacturers were supplied by the Union Iron Works, Spokane, Wash. The Worthington Pump & Machinery Corp. supplied the two turbine pumps, the three clarified-water pumps and most of the V-belt drives. The Victor Equipment Co., San Francisco, Cal., furnished the three Kimball-Krogh sludge pumps. Walworth valves are used on the water lines and Binks spray nozzles on all the sizing screens. Reeves variable-speed drives are used on the sand classifiers and on some of the feeders. All the chutes were electrically welded in the construction company's shops.



The cement-blending plant with compressor building at left. Portable cement unloaders are on platform at right.

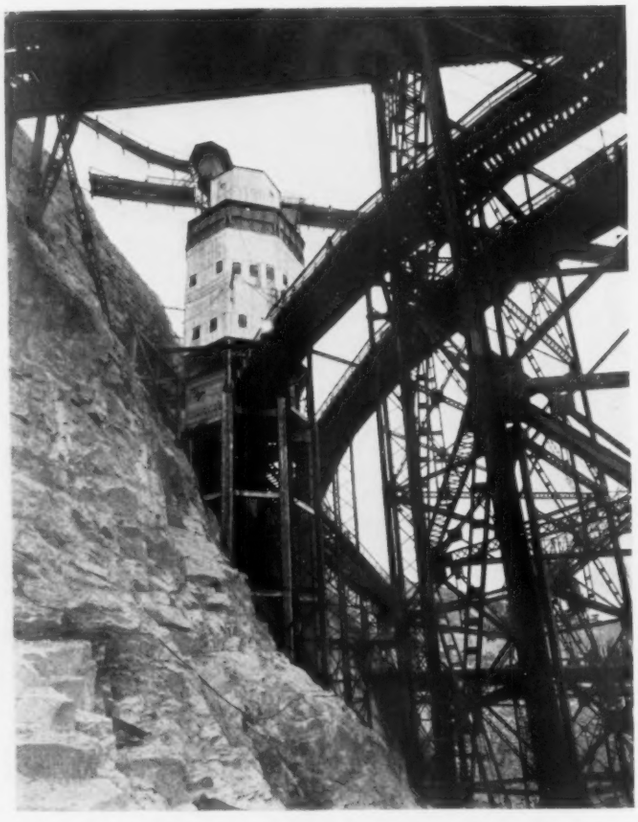
Concrete being placed from two trestles at the west dam abutment. Aggregate is received at the mixing plant from a belt-conveyor system on the suspension bridge.

The cement storage and blending plant is located on the west bank of the river at an elevation of 1,410 ft., which is the approximate grade of the government railroad that connects with the Northern Pacific Ry. at Odair, Wash. Bulk cement is delivered in box-cars from the five Washington cement plants which share in the first 4,200,000-bbl. contract. Two portable Fuller-Kinyon cement unloaders feed from each car to one of eight steel silos which are arranged in two rows. Two additional unloaders will be installed in the spring. These are 27 ft. in diameter and 56 ft. high and have a capacity of 5,000-bbl. each. Two additional silos of the same capacity are used for blending. The pumps operate on 50-lb. pressure.

Under one row of 4 silos is a 20-in. helicoid screw conveyor, 160-ft. long, which reclaims cement from these silos. Four 16-in. helicoid screw conveyors, each 27-ft. long, reclaim from the other 4 silos to this main screw. The feed from each of these silos is controlled by vane feeders, each independently driven through a Reeves variable-speed transmission. The motors driving the feeders discharging to the short screw conveyors drive these screws also. Each feeder has a capacity range of from 50 to 300-bbl. per hr. The main collecting screw has a capacity of 600-bbl. per hr. This system allows blending from any desired number of silos in a wide range of combinations. The collecting screw is driven by two 40-hp. motors through herringbone speed-reducers, one motor and reducer at each end.

The collecting screw conveyor discharges the cement to a 98-ft., 8-in. continuous bucket elevator, which is incased in a dust-tight steel housing, and discharges through a selective split chute to either or both of the two blending silos. The elevator is driven by a 20-hp. motor through a herringbone reducer.

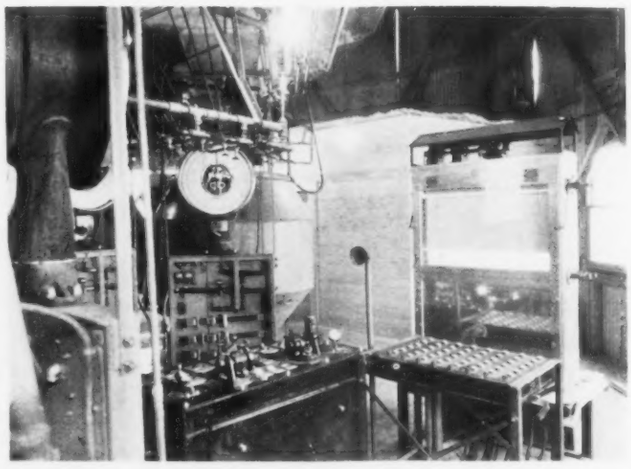
Blended cement is reclaimed from one of these



An unusual view of the west mixing plant showing the upper pouring level and the end of the suspension bridge.

silos through a common opening with a dust-tight chop-gate valve to a pair of 18-in. screw conveyors, each having a capacity of 500-bbl. per hr. These are independently driven by 15-hp. motors so that either one or both can be operated at any time. The discharge opening of the other silo is at the discharge end of these screws, so that they need not be operated when drawing from this silo alone. Directly under this opening is the F. L. Smidth Fluxo No. 265 pumping system, which transports the blended cement to the two concrete central-mixing plants. This operates on 100-lb. air pressure.

The Fluxo pump discharges through a 11-in. pipe-line, 2,000-ft. long, into the west mixing-plant bins at an elevation of 1,126-ft., a drop of about 250 ft. A continuation of the same pipe transports cement across the river to the east mixing-plant, which is at the same elevation, a total distance of 6,200 ft. This pipe-line crosses the river on the same suspension bridge which carries the aggregate-conveyor system running in the opposite direction. The pneumatic cement-conveying system has a capacity of 1,000-bbl. per hr. when delivering to the west plant and 450-bbl. when suppling the east plant.



Control board and some of the batching equipment in the west mixing plant.

The Jeffrey Mfg. Co. furnished all the mechanical handling equipment, including feeders, screw conveyors and the elevator.

The two concrete central-mixing plants which will produce all the concrete for the dam and its appurtenances are located on opposite banks of the river just downstream from where the section of the dam meets the east and west rock abutments. Both of these plants are identical in design and each will mix half of the concrete required. Each plant has a capacity of 320-cu.yd. per hr.

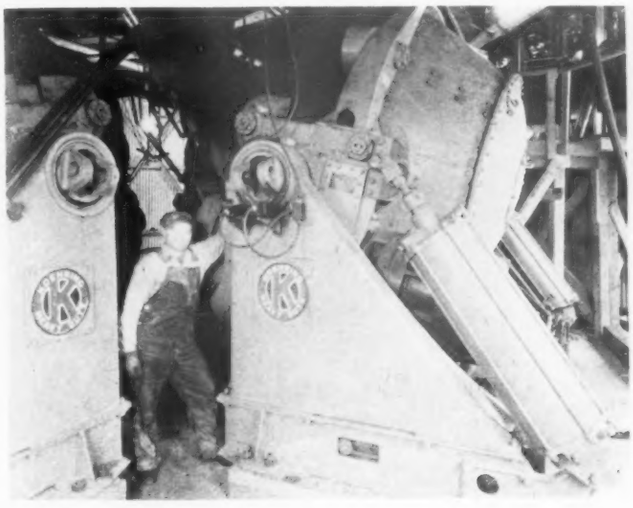
At each plant the 11-in. cement pipe-line discharges its contents into an expansion chamber which reduces the air velocity and allows the air to escape to the atmosphere through a vent. The cement drops through a 2-way spout into the two cement-storage compartments. Aggregates are received on belt-conveyors EE and FF for the west and east mixing plants, respectively. Each conveyor discharges through a rotary spout into any of the 8 compartments in the aggregate-storage bin. An operator at this point controls the reclaiming of aggregate from the main stock-pile and the handling to the cement-mixing plant bins.

The storage unit at each plant is a C. S. Johnson Octo-Bin with 8 compartments for the sand and 4 sizes of gravel. These have a combined capacity of 1,500 tons, and a 2-compartment center bin holds 1,350 bbl. of cement. Two 2-way screw conveyors under each cement compartment discharge into two vane feeders which discharge to the two cement-weighing batchers. Electric vibrators and air jets prevent sticking of the cement in the bins and insure complete discharge of the batchers. The aggregate is discharged by gravity into 5 aggregate weigh-batchers, one for each size of aggregate. Each of the 7 batchers has a 5-beam scale. All the bin and batcher gates are air-operated. The water used in the mix is weighed.

The contents of the aggregate- and cement-weighing batchers are discharged into a common central hopper. A revolving spout allows discharge into any of the 4-cu.yd. Koehring conical concrete mixers which are grouped around a central discharge opening. These mixers are charged and discharged through a single opening. The entire arrangement is designed to keep the mixers in continuous operation. Most of the equipment in these plants was supplied by the C. S. Johnson Co.

All the concrete for this dam will be placed in buckets, as no chuting of the concrete is permitted under this contract. The concreting is being done from two steel trestles, one at elevation 1,024 and one at elevation 950. When pouring from the 1,024-ft. trestle, which is at plant level, the concrete mixers will discharge directly into 4-cu.yd. Blaw-Knox concrete buckets mounted on Koppel flat cars. When pouring from the 950-ft. level the concrete is discharged through a spout into one of two 4-cu.yd. ship cars. These are lowered alternately to the low level, where the concrete is transferred through a hopper to buckets on flat cars on the lower tracks. Davenport Diesel-electric locomo-

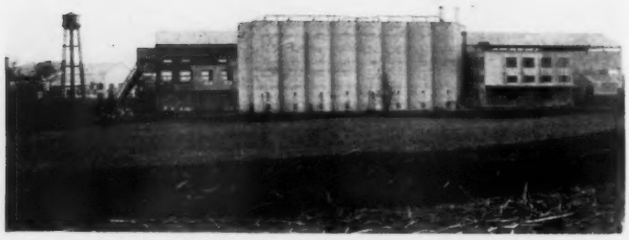
(Continued on page 79)



Several of the 4-cu. yd. tilting mixers in the west mixing plant.

CEMENT ...in 1935

Industry Begins to Show Profit. . . . Rumors of New Plants Heard. . . . Production Starts at New National and Washington-Idaho Mills. . . . Missouri, Spokane, Bessemer, Alpha, Calaveras and Lehigh Companies Make Major Changes.



Plant of the National Portland Cement Co. at Brodhead, Pa., with cement-storage silos and pack-house in foreground. Clay and crusher buildings are in left background.

THE cement industry of the United States ended 1935 in a much better financial condition than has existed in the industry in years. Many cement companies were able to show a substantial profit in spite of the fact that the industry's total production and shipments were slightly below those of 1934. This condition can be attributed largely to the fact that modernization programs carried out in many plants now make it possible for them to show a profit at low ratios of production to capacity. Revision of capital structures also had a beneficial effect. Prices, increased mainly because of the N.R.A., have also held up well in most sections since the abandonment of the code for the cement industry.

Shipments for the first 9 months of the year lagged behind those of 1934, due mainly to the gradual tapering off of the government's public-works program. Private construction increased rapidly during the year to the highest level reached in years and indications point to a continued increase in 1936. The effect of this demand combined with the early stages of the current Federal construction program resulted in a sharp increase in demand in October to the highest level of the year and several preceding years. A marked increase in shipments is indicated for 1936.

The productive capacity of the industry underwent little change. The addition of two new plants, one of small capacity, and the effect of improvements to a number of other plants was counterbalanced by the abandonment and dismantling of several other plants. Equipment long idle in some plants was also definitely retired from service.

Expenditures for plant improvements in 1935 far exceeded those in 1934. Many important improvement programs were completed or are under way, but most of the work done consisted of installations which were of minor importance individually although impressive in the aggregate. Some of the more important developments are mentioned in this article.

The optimism of cement producers over future prospects, based to a large extent on the revival of private building, is evident from the impressive improvement programs contemplated for 1936. Active rumors are current regarding the construction of new plants in several localities, especially Florida, Mississippi and California. A number of important rebuilding and improvement programs which have long been contemplated are expected to be announced shortly.

The most important addition to the capacity of the cement industry during 1935 was the new plant of the National Portland Cement Co. at Brodhead, Pa., which was reviewed a year ago. The first of the two kilns at this plant went into operation March 15, 1935. This was the first new plant to be erected since 1929 and added 1,250,000 bbls. to the annual productive capacity of the industry. A complete description of this plant was published in the May, 1935, issue of PIT AND QUARRY.

This is a wet-process plant using the most modern methods and equipment. Among the features which contribute to its efficiency and economy is the location of the plant within a few hundred feet of the quarry, whose floor is only a few feet below the level of the primary crusher. Notable also is the fact that only eleven major equipment units are required in the rock-crushing, raw-grinding, clinker-grinding, coal-grinding and kiln departments. This simplicity was attained without the loss of flexibility. Wherever possible, alternative flows were provided for the material to prevent shut-downs, due to the failure of any equipment unit. The plant covers an area of only 22 acres, yet it is so designed that its capacity can be doubled or trebled without exceeding these dimensions and without interfering with the operation of existing equipment.

The only other new plant completed in 1935 was that of the Washington-Idaho Lime Co., at Orofino, Idaho, which went into operation September 26, 1935. This plant, which was completely described in the October, 1935, issue of PIT AND QUARRY, is a small operation with a present daily capacity of 240 bbl. This can be doubled by the installation of additional raw- and finish-grinding tube-mills. This plant is thought by some cement experts to be an indication of a trend toward small plants similar to that which has been evident for several years in the crushed-stone and sand-and-gravel industries. Such plants, they say, will result in a lower cost to

the cement consumer through shorter freight hauls and resulting lower transportation charges. Each plant will serve a limited surrounding area and will eliminate the present condition under which the cost of shipping from existing plants is sometimes double the cost of the cement f.o.b. at the plant.

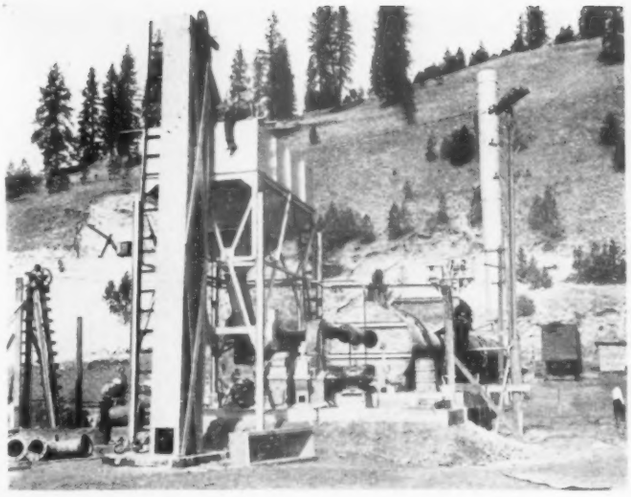
This plant was built at very low cost, partly because of its simplicity of design, which also contributes to its economy of operation. The down-hill design greatly reduces the amount of handling. Inclosure of any of the equipment was not considered necessary because of the mild climate in this section.

One of the most interesting developments of the year in the cement industry was the improvement program completed by the Spokane Portland Cement Co. at its plant at Irvin, near Spokane, Wash. This program included the installation of a Polysius Lepol kiln unit, said to be the first in the Western hemisphere. Other installations included a Babcock & Wilcox mill with a Sturtevant separator for finish-grinding, Stephens-Adamson Redler conveyors for handling stone and cement, Polysius Cera pumps for handling pulverized stone and cement, Polysius aërating systems in bins and silos and many other items of equipment. New reinforced-concrete silos for cement and raw-material storage were also erected. A complete description of the improvements made to this plant appears elsewhere in this issue.

New cement plant of the Washington-Idaho Lime Co. viewed from the quarry, showing raw-material tube-mill in center and slurry tanks at right.

The Missouri Portland Cement Co. continued its extensive improvement program during the year. An important step in this work was the recent installation of a new raw-material blending and handling system at its Prospect Hill plants near St. Louis, Mo. This system is designed to serve both the old "Red Ball" plant and the newer high-early-strength cement plant and utilizes the equipment of the latter.

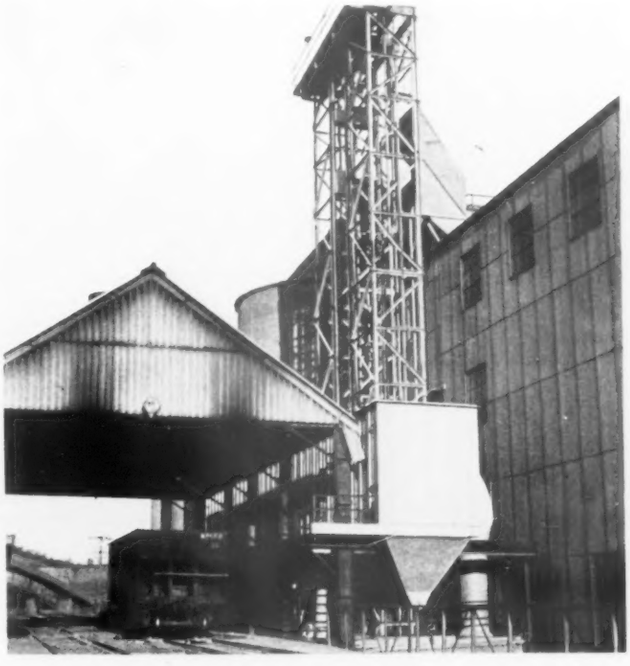
Preliminary crushing of stone is done at the quarry and the cars discharge their contents from a trestle into bins. The storage and handling system here has not been changed since a description of the high-early-strength plant was published in the February 13, 1929, issue of PIT AND QUARRY.



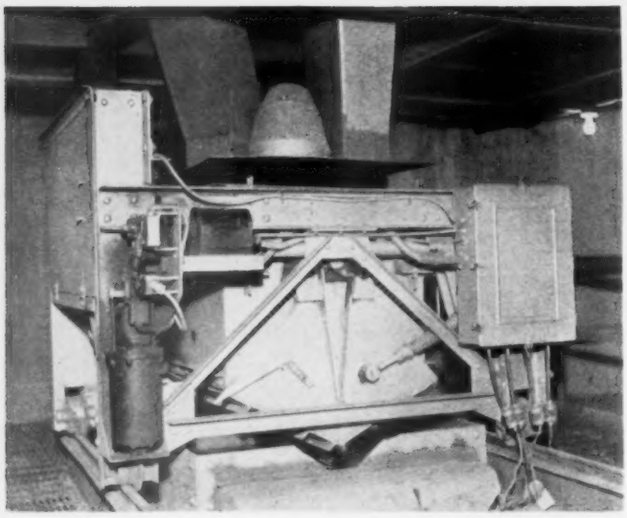
Coal elevator and bin at the Washington-Idaho plant with quarry visible in background.

The new equipment begins with a set of two table feeders for feeding iron ore in the described proportions to a movable Blaw-Knox weighing batcher. When feeding the "Red Ball" plant, three other table feeders are used with the same batcher which is mounted on rails. Apron feeders under the limestone bins supply a stationary Blaw-Knox automatic weighing batcher.

Under the batchers is a reversible pan conveyor which feeds one way for one plant and in the oposite direction for the other. For the "Red Ball" plant a short belt-conveyor takes the pan-conveyor discharge to a long belt-conveyor in a tunnel which was built between the plants. When material is being blended for the high-early-strength cement plant the pan conveyor feeds direct to the raw-mill room of that plant. A new Norblo dust-collector was also installed.



Discharging trestle, skip hoist and dust collector at the crushing plant of the Missouri Portland Cement Co.



Automatic weighing batcher mounted on rails in the crushing plant of the Missouri Portland Cement Co.

The Southwestern Portland Cement Co. early in 1935 put into operation a delivery system which has greatly enlarged the truck-shipping area of its plant at Victorville, Cal. A fleet of ten Sterling trucks, powered with Cummins Diesel engines, was purchased. The trucks are used as tractors drawing semi-trailers capable of hauling 100 bbl. of sacked cement. Shipments within a radius of 250 miles are being made economically. The characteristic economy of Diesel engines was demonstrated when the engines were opened after about 75,000 miles of vehicle travel for carbon removal and it was found that the valves were in good condition.

Many other plants on the Pacific Coast are also

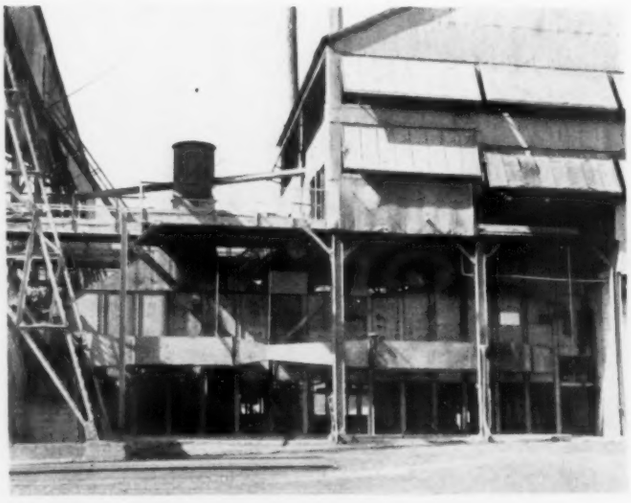
One of the 10 Diesel-engine trucks which are making a remarkable record for the Southwestern Portland Cement Co.

shipping with trucks for long distances, but most of this hauling is now being done by contract with gasoline-engine trucks. The application of Diesel engines to this field should result in interesting developments.

The Calaveras Cement Co. in 1935 installed a Lee Process clinker cooler on one of its kilns, replacing a rotary cooler. This is said to be the first installation of this type of cooler on an oil-fired kiln. Similar equipment was installed during the year at the plant of the Cumberland Portland Cement Co. at Cowan, Tenn. A Dixie hammer-mill was also added at this plant. The Federal Portland Cement Co., Buffalo, N. Y., also installed a Dixie hammer-mill.

The Alpha Portland Cement Co. continued its extensive improvement program. At its Alpha, Mo., plant a Bradley Miag Calcinator, the first in this country, was installed. Early in the year extensive improvements were also made in the coal department. Natural gas had been used for burning in recent years. A Model 450 1¼-cu. yd. Marion shovel was installed at the company's plant at Manheim, W. Va. A contract was let recently for razing the buildings and salvaging the equipment at the Alpha plant at Bellevue, Mich.

The Bessemer Limestone & Cement Co., Bessemer, Pa. completed the rebuilding of its stone crush-



New grate-type clinker cooler installed in the plant of the Calaveras Cement Co., San Andreas, Cal.

ing and handling department, which included rebuilding of the stone storage and the installation of new belt-conveyors and a Dixie hammer-mill. Two Vanderwerp recuperators were installed on the 10-ft. wet-process kilns.

The Lone Star Cement Co., Alabama, Birmingham, Ala., installed two No. 138 Babcock & Wilcox coal mills for the direct-firing of two of its kilns. Similar equipment was installed on 10 of the 13 kilns of the Marquette Cement Mfg. Co., which has plants at Oglesby, Ill. and Cape Girardeau, Mo.

The Peerless Portland Cement Co., Detroit, Mich. also purchased two mills.

The Three Forks Portland Cement Co., Trident, Mont., which completed an extensive improvement program in 1934, made additional improvements in 1935 and is now installing two Babcock & Wilcox coal-grinding mills.

The Lehigh Portland Cement Co. continued its improvement program during 1935 by the installation of four Schaffer Poidometers at its Iola, Kan., plant. At the Metaline Falls, Wash., plant 12 new reinforced-concrete silos were erected, a new 8-ton gasoline locomotive and six dump cars were purchased, and many other improvements were made.

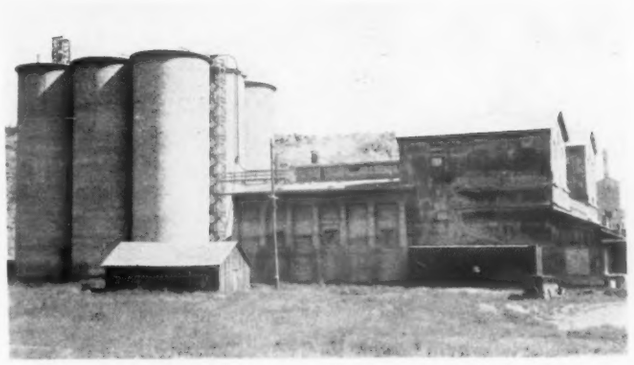
An improvement program at the Idaho Portland Cement Co. plant at Inkom, Idaho, included additional storage capacity for 50,000 bbl. of cement. A Traylor-Cheesman burner was installed on the single kiln in this plant.

The California Portland Cement Co., Colton, Cal. installed new Allis-Chalmers equipment for raw grinding. The old centralized air-compressor installation at this plant was replaced by Fuller rotary compressors located at the point of air utilization.

The system installed by the Santa Cruz Portland Cement Co., Davenport, Cal., for water shipment of cement was actually completed late in 1934 except for a few minor details. This system consists of a 2,400-ft. steel-and-concrete dock at Davenport, where the cement from the plant storage silos is pumped to the self-loading boat "Santacruzcement." This boat transports cement to storage and packing plants at Portland, Ore., and Alameda, Stockton and Long Beach, Cal., for further distribution.

The Oklahoma Portland Cement Co. installed an experimental plant for the manufacture of "dry ice" at Ada, Okla. This system utilizes dust-free gases from the kilns. Another Ideal plant, that of the Arkansas Portland Cement Co. at Okay, Ark., installed a Norblo dust-collector in the mill building.

The San Antonio Portland Cement Co., Cementville, Tex., is installing a new 8-ft. by 50-ft. Traylor 4-compartment finishing mill of novel design. This unit will be driven by a 1,250-h.p. electric motor requiring a special type of starting equipment and said to be the only one of its kind in the country. A new 2,000-h.p. Diesel engine is also being installed in the power-generating plant and another Norblo dust-collector will be added.



The improved plant of the Three Forks Portland Cement Co. at Trident, Mont.

The Wabash Portland Cement Co., which has made many important improvements and additions to its plant at Osborn, O., installed two Oliver United American-type slurry filters.

A few of the many other improvements include the purchase by the Southern States Portland Cement Co., Rockmart, Ga., of a Marion Model 450 1¼-cu.yd. shovel. The Huron Portland Cement Co. built 6 new cement-storage silos at Saginaw, Mich., with a capacity of 50,000 bbls. These were erected by the Burrell Eng. & Constr. Co. The Monolith Portland Cement Co. installed new F. L. Smidth Kominuters and Tyler Hum-mer screens at its plant at Monolith, Cal. A new crane was installed in the storage department. Among the many other improvements now under way is the installation of Cottrell dust-arrestors by the Western Precipitation Co. at the plant of the Cowell Portland Cement Co. at Cowell, Cal.

The self-unloading boat "Santacruzcement" being loaded at the new dock at the Davenport, Cal., plant of the Santa Cruz Portland Cement Co. The new storage silos and pump-house are in the foreground.

AGGREGATES . . . in 1935

Production Trend Is Upward Portable-Plant Competition Menacing . . . Established Operators Fare Better on Governmental Contracts. . . . Many New Plants and Improvements.

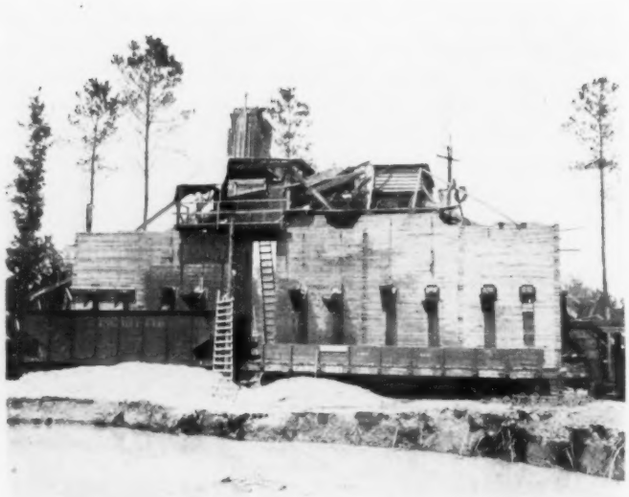
THE sand-and-gravel, crushed-stone and slag industries continued the upward trend of production begun late in 1933 and ended 1935 in a better financial condition than has existed in many years. The total production for the year remained far below the peak years of 1928 and 1929 but slightly exceeded that of 1934. Economies achieved in plant operation through the use of improved equipment and methods now make it possible for producers to show a profit at a relatively low ratio of production to capacity. Average prices have fallen slightly since the demise of the code for these industries but remain far above the prices prevailing before the code went into effect. This lowering in average value of product is due mainly to price wars in a few localities where productive capacity is far in excess of demand.

Highway construction remains the largest market for aggregates but there was a marked increase in the amount of material required for private construction which is now definitely on an upward trend. Governmental construction projects were not as important a market as in 1934 but the P.W.A. program which began late in the year resulted in a late season demand and is also expected to help to send the industry off on a good start in 1936.

Many new sand-and-gravel and crushed-stone plants were built during the year and many important programs were carried out. In hundreds of other plants minor improvements were made which combined form an impressive total. A few of these improvements were financed by R.F.C. loans but the vast majority were financed in the usual manner without governmental assistance.

Competition from contractor- and government-operated plants, mostly portable, remained probably the chief obstacle to a return to normal conditions in these industries. There is, however, a rapidly growing tendency on the part of permanent-plant owners to supplement their permanent facilities with portable units. The operation of portable plants by commercial operators specializing in this work is also growing. The year was also marked by a growing tendency on the part of the government to let contracts to established aggregates producers for material to be used in large construction projects.

By far the most important sand-and-gravel plant built during the year and the largest ever built is that erected by the Mason, Walsh, Atkinson, Kier Co. to supply aggregates for Grand Coulee Dam in Washington. This plant, which only recently went into operation, has a processing capacity of 2,500 tons per hr. and produces 1,000 tons per hr. of finished material. The many outstanding features of this plant are completely described in an article in this issue of PIT AND QUARRY.



The plant of the Carolina Sand & Gravel Co. at Kathwood, S. C., with dredge pond in foreground.

An interesting sand-and-gravel plant of 100-cu.yd. per hr. capacity was built by the Carolina Sand & Gravel Co. at Kathwood, S. C. This operation boasts an efficient Diesel-driven dredge and a simple and economical plant. The dredge pump is an Amsco 8-in. Type M unit and is driven through V-belt by a 130-hp. Caterpillar Diesel engine. A 65-hp. Caterpillar Diesel engine drives a generator, which supplies current to drive the remainder of the dredge equipment and the shore plant equipment.

Sand is removed from the material by stationary screens at the dredge-line discharge and is graded in a settling tank. The gravel passes through a screw washer and is sized by a Pioneer 3-ft. by 17-ft. horizontal shaker screen. Bins of latticed-timber construction allow the materials to drain before being loaded into cars for shipment.

The James River Hydrate & Supply Co., which early in 1934 moved its lime plant from Indian Rock, Va., to a new location at Calera, in June, 1935, put into operation a new limestone-crushing and pulverizing plant. Stone for this new plant is loaded separately from that for the lime plant. Preliminary crushing and sizing is done by a Diamond jaw crusher, a Gruendler pulverizer and a Niagara

vibrating screen. Final reduction is done by a Raymond high-side 5-roller mill equipped with a Whizzer separator, rotary feeder, exhaust fan, cyclone and twin dust collectors. A small furnace supplies heat for drying the material. Most of the pulverized limestone produced is used for agricultural purposes.

Another important plant of 1935 was that built by the Columbia Construction Co. at North Bonneville, Wash., to supply aggregates for the main body of Bonneville Dam on the Columbia River. This plant has a capacity of 400 tons per hr. of finished aggregates and went into operation in September.

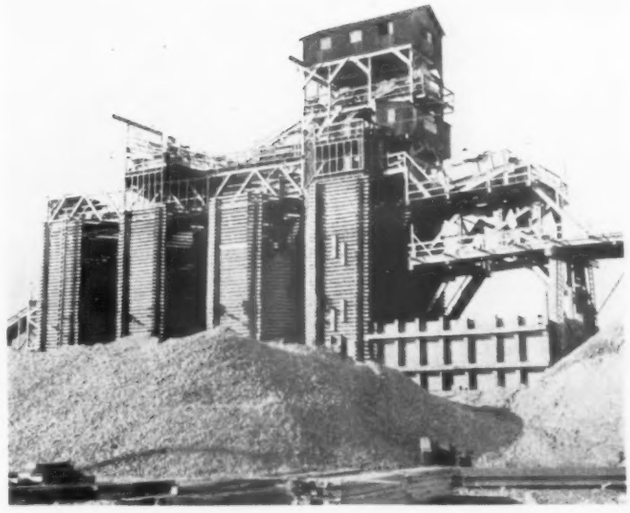
Material is obtained from deposits upriver from the dam and is hauled to the plant in railroad hopper cars. Traylor vibratory feeders discharge the material from a track hopper to conveyors leading to a Buffalo vibrating screen. The oversize is reduced by a Wheeling jaw crusher and, with the screen "throughs," is conveyed to the top of the screening building. Sizing is done by 5 Buffalo screens and 2 Bodinson sand classifiers. Sized aggregates are stored in 4 silos and in stock-piles. Gates at the sides of the silos allow any desired size of material to be returned to a Symons cone crusher for further reduction. This material is then rescreened. Three Traylor feeders and chutes reclaim the material from storage to a tunnel conveyor. A second conveyor discharges to bins over the concrete-mixing plant.

An interesting development was the new plant of Limestone Products, Inc., near Dallas, Ore. This plant, which was described in the December, 1935, issue, of PIT AND QUARRY, produces agricultural limestone and is one of the few plants to specialize entirely on this product.

Drilling and blasting methods are conventional and stone is hauled to the plant in Ford trucks. After reduction in a jaw crusher the stone is fed to a Williams Universal hammer-mill for final reduction. There is bin storage for 250 tons of material which is sacked by spout baggers. A timber warehouse stores 1,000 tons of sacked limestone. Because of the seasonal demand, five stacks with a capacity of 450 tons each have been built up. These are covered with tarpaulins and have timber floors.

The Louisville Sand & Gravel Co., Louisville, Ky., a new concern, in July started operating a new sand-and-gravel plant having a capacity of about 40 tons per hr. The river dredge was rebuilt from a government boat and has an Ellicott 12-in. pump. Screening is done on the dredge, stationary screens being used for sand and a triple-deck 5- by 12-ft. Robins Gyrex screen for coarse sizes. Barges of sized material are towed to the shore plant. There is a total of 2,400 tons of bin-storage capacity at the plant and a 270-ft. stock-piling conveyor gives additional capacity. Stephens-Adamson conveying equipment is used. A 30,000-lb. Fairbanks-Morse truck scale is housed in a new office building.

Another sand-and-gravel plant was built in 1935 to supplement the two traveling plants at Cole, Mont., which supply materials for the Fort Peck Dam. The two traveling plants were described in the January, 1935, issue of PIT AND QUARRY which reviewed developments of 1934 and the new stationary plant was completely described in the October, 1935, issue. All these plants are 75 mi. from the dam site.



Sand-and-gravel plant of the Columbia Construction Co. which is supplying aggregate for the construction of Bonneville Dam.

Raw material is excavated in the pit by a Bucyrus-Erie 2-cu.yd. electric shovel and a 1¼-cu.yd. Erie gas-air shovel. These load the material into 6-cu.yd. Koppel cars, which are hauled to the plant by General Electric 12-ton electric trolley locomotives.

Belt-conveyors are used throughout the plant for all handling. Material over 3½ in. in size is rejected by a revolving scalping screen to a 20-in. Allis-Chalmers gyratory crusher. A vibrating screen scalps 1½-in. and 3-in. material to two 49-in. Symons cone crushers. Crushed aggregate sizing is done by two vibrating screens. Eight vibrating screens are used for sizing the washed sand and gravel. Sand is further classified by four conical sand separators. This plant, like the two traveling plants, was designed by the Link-Belt Co. in cooperation with the company engineers and most of the equipment is Link-Belt.

The 300-mi. long aqueduct which is being built by the Metropolitan Water District of Los Angeles, Cal., was responsible for the erection of a number of extremely interesting sand-and-gravel plants. This aqueduct will bring water 300 mi. from the Colorado River at Parker, Cal., to the Los Angeles area. Twenty-six plants were erected to supply

Plant of Limestone Products, Inc., near Dallas, Ore., with storage piles covered by tarpaulins.

materials for this project. Some of these plants are portable, some are permanent types and others are of an intermediate type commonly called semi-portable. Some of the material used for that part of the project nearest the Los Angeles Metropolitan area is being supplied from existing permanent plants. Some of the 26 plants are operated by aqueduct contractors, some by the Metropolitan Water

Sand-and-gravel plant operated by the Metropolitan Water District to supply aggregates at Fargo Canyon on the aqueduct.

District, and some by independent operators and established permanent-plant operators subletting from aqueduct contractors.

Probably the most elaborate of these plants are four operated by the water district, particularly the one at Fargo Canyon. At this plant a Lima shovel and Ford trucks are used in the pit. A grizzly diverts the oversize into an Allis-Chalmers jaw crusher. A bucket-elevator feeds a Link-Belt vibrating screen from which the oversize goes to an Allis-Chalmers gyratory crusher. Removal of undesired sizes is done on a Symons and a Link-Belt screen. Sized material is stock-piled and reclaimed by a tunnel conveyor.

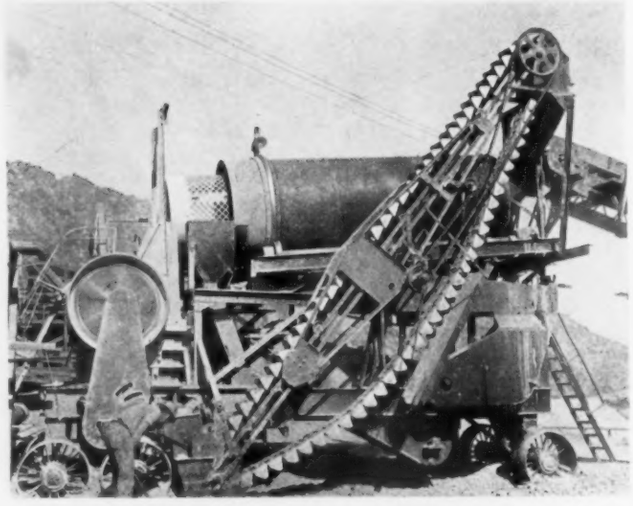
A Plymouth locomotive hauls the material in Western dump cars to transfer bins, from which a conveyor rehandles it to the concrete batching plant. Here another Symons screen does the final sizing and a Roto-Clone removes minus 200-mesh material from the sand. This plant has a capacity of about 40 cy-yd. per hr.

The Wide Canyon plant of the Metropolitan Water District is supplying aggregate for several sections of the aqueduct. The deposit is excavated with a gasoline shovel loading Ford trucks. A Symons screen scalps the oversize into an Allis-Chalmers gyratory crusher. All the material passing the screen can go either to a stock-pile for tunnel recovery or direct to another Symons screen over the batching plant for final sizing.

Graham Bros. Inc., established producers of aggregates and concrete in the Los Angeles area, are subcontracting aggregates on several sections of the aqueduct. One of these plants is at the West Eagle Mountain Tunnel. A Northwest drag-line loads the trucks, which haul the material 3½ mi. to the plant. A Pioneer portable plant, equipped with a jaw crusher and revolving and vibratory screens, processes the material. A Sutorbilt air-cleaner removes extreme fines from the product, which is chuted direct to bins at the concrete batching plant. On these projects are used a number of the company's 45 new International trucks which were driven through from Chicago last winter in one of the most spectacular drive-aways in automotive history.

The E. M. Hawley Co. operates two aggregates plants on the aqueduct under subcontracts. Plant No. 2, completed late in 1935, was built to produce 200,000 cu.yd. of material for the Barret, Hilp & Macco Corp. on Schedules 2 and 3. Plant No. 1 is producing aggregates for John & Bressi for Schedules 4 and 5.

Plant No. 2 is the more interesting of the two plants which are similar in many ways. In the pit a shovel loads the excavated material to trucks



Portable plant operated by Graham Bros. which supplies some of sand and gravel used in building the Los Angeles aqueduct.

which haul it to the plant hopper. A belt-conveyor feeds a 4-ft. by 20-ft. Symons double-deck screen having a grizzly half-deck. Oversize from the grizzly goes to a Wheeling jaw crusher and the screen prepares four sizes of aggregates. Oversize from the screen goes to another Wheeling jaw crusher. The crushed product is elevated to a 3-ft. by 8-ft. Symons double-deck screen above the first screen.

Four belt-conveyors radiating from the plant discharge the sized materials to stock-piles over a tunnel. The tunnel-conveyor system reclaims one size of material at a time to the concrete batching plant. When ⅛-in. minus material (sand) is handled, it is first passed through a Sutorbilt air-washer which removes excess dust.

New crushed-stone plants were also built by the Temple Stone Co., Reading, Pa., J. S. Teeter, Gettysburg, Pa., and the Monmouth Stone Co., Mon-

mouth, Ill. McKenzie & Holm, Inc., Waterloo, Ia., built a new plant using a Bakstad crusher.

The Anunsen Co., Salem, Ore., in May, 1935, erected a sand-and-gravel plant of 50-cu.yd. per hr. capacity, using some equipment from an older plant. Material is excavated with a 2-cu.yd. Sauerman Crescent scraper system. New equipment includes a 3-ft. by 10-ft. triple-deck Niagara vibrating screen and a deep-well pump.

Another small new plant is that built by the Chillicothe Sand & Gravel Co. at Chillicothe, Ill., late in 1935. A 1-cu.yd. Sauerman cableway excavator is used. New equipment in the plant includes a 3-ft. by 6-ft. double-deck Simplicity screen, an Iowa Mfg. Co. jaw crusher and a Pomona deep-well pump.

Seybold Bros., Dunkirk, N. Y., completed a new crushed-stone plant using Webster and Good Roads equipment and an Eagle screw washer. A 700-ton per day plant was built by the Louisville Crushed Stone Co., Louisville, Ky.

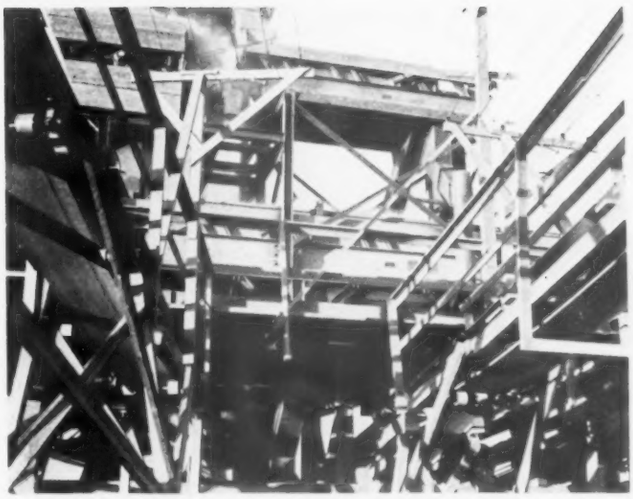
The Ohio River Sand & Gravel Co. in February put into operation a new plant with unusually large storage facilities at New Martinsville, W. Va. This plant has a capacity of about 4,000 tons daily and was built primarily to supply over 2,000,000 tons of aggregate for the construction of the Tygart Reservoir Dam near Grafton, W. Va.

The Green Bros. Gravel Co. of Lexington, Miss., in 1935 erected a small new plant to supply aggregate for highway work. The equipment includes an 8-in. Amsco dredge pump and a 100-hp. Worthington Diesel engine. A LeRoi gasoline engine operates the plant equipment.

A. J. Clementz's Sons completed a new gravel plant near Beach City, O., with a capacity of 100 tons per hr. The equipment includes Bartlett & Snow rotary scalping and sizing screens and a Telsmith gyratory crusher.

The Rockford Stone Co. in 1935 added a new pulverized limestone plant to its facilities at Rockford, O. Rock from the older crushing and screening plant is further processed by a Williams 4-roll pulverizer equipped with a cyclone and a furnace for drying.

The Standard Slag Co. in May put into operation a new slag plant near Wheeling, W. Va. A new



The two vibrating screens and part of the stockpiling system at E. M. Hawley Plant No. 2 on the Los Angeles aqueduct.

screening plant was erected by the Woodstock Slag Co. at Anniston, Ala., the equipment including a Robins vibrating screen and a Symons screen.

Theodore Arenz erected a new 100-ton per hr. crushed-stone plant near Heather, Ore. The equipment includes a Pioneer jaw crusher, two Pioneer vibrating screens, a Telsmith Pulsator screen and a Symons cone crusher. The Hawarden Gravel Co., Hawarden, Ia., purchased a Universal portable plant. A Pioneer plant was bought by the Memphis Stone & Gravel Co., Pope, Miss., and the North Virginia Sand & Gravel Co., Alexandria, Va., also bought a portable plant. A Telsmith semi-portable plant was put in operation by the Louis Ebbe Gravel Co., Waupaca, Wis.

Other new aggregate plants built in 1935 include the following: Liberty Limestone Co., Buchanan, Va.; Geneseo Sand & Gravel Co., Geneseo, Ill.; Zanesville Gravel Co., Conesville, O.; Southwest Sand & Gravel Co., Pyott, Ark.; Gifford-Hill Co., Forest Hill, La. Among new plants now under construction are two for the Pioneer Sand & Gravel Co. at Steilacoom, Wash.

An improvement program interesting to small sand-and-gravel plant operators was that completed early in the year by the Shenk Bros. Gravel Co., Durand, Mich. The latest type Amsco 8-in. Type M

New crushed stone plant of J. S. Teeter at Gettysburg, Pa.

Shovel installed by the France Stone Co. at its Silica, O., plant.

New crushed-stone plant of the Temple Stone Co. near Reading, Pa.

pump was installed on the dredge and an additional Simplicity vibrating screen was installed to rewash material before shipment. A Knickerbocker soft-stone eliminator keeps the product within specification limits. This plant was described in the December, 1935, issue of PIT AND QUARRY.

The Andersen Sand & Gravel Co., which has operated a plant at Juniata, Mich., for years, early in 1935 added facilities for the production of blast sand. Equipment installed for this purpose included a Symons vibrating screen, a double New Holland roll crusher and a 50-hp. McCormick-Deering Diesel engine.

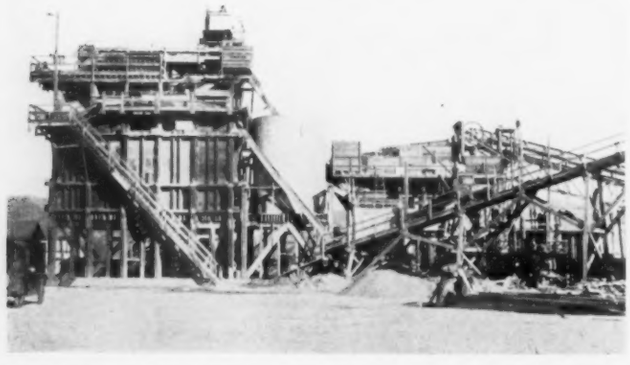
An International truck with a Fruehauf 10-cu.yd. semi-trailer and an 8-cu.yd. trailer of the same make was purchased. A portable screening plant was also erected for the production of a road gravel with a controlled clay content. A Simplicity screen and Continental gasoline engine are used. This plant was described in the August, 1935, issue of PIT AND QUARRY.

John D. Gregg, operator of several plants in the Los Angeles area carried out an extensive improvement program at his plant at Roscoe, Cal. This plant was built in 1932 with a capacity of 60 tons per hr. which is now doubled. A new 3-cu.yd. scraper operated by a 100-hp. hoist feeds the material to the plant. Scalping and primary crushing are done with existing equipment. Two new Allis-Chalmers Newhouse crushers have been installed for further reduction of the material. Four vibrating screens were added to do the final sizing.

The East Peoria Sand & Gravel Co., East Peoria, Ill., improved its plant by the installation of a Simplicity screen and a Howe 18-ton truck scale. Improvements were also made to a concrete block plant operated by the company.

The Campbell Limestone Co. in February completed the rebuilding of its plant at Gaffney, S. C. The quarry is worked by the bench method and the material is fed by a Thew Lorain crane handling hand-loaded skips to the Allis-Chalmers primary crusher. A conveyor feeds to a Universal scalping screen and further reduction of the rock is done by an Allis-Chalmers Newhouse crusher. Final sizing is done by two Tyler Hum-mer screens.

The Blue Ridge Stone Co., Blue Ridge, Va., improved its plant by the installation of a Niagara vibrating screen. Trucks haul some of the smaller sizes of stone to a new stone sand plant. New equipment in this plant includes a Universal vibrating screen, two Allis-Chalmers Aerovib screens, an Allis-Chalmers No. 2 Pulverator and a double-screw washer of the same make.



View of the plant of John D. Gregg at Roscoe, Cal., showing the extensive improvements under way.

The Inland Lime & Stone Co., Manistique, Mich., in 1935 built an extensive addition to the stock-piling and handling facilities at this plant which cost as much as half-a-dozen ordinary plants. A complete description of this plant was published in the January 14, 1931, issue of PIT AND QUARRY, shortly after it was built and by referring to this description a clear idea of the changes made will be obtained.

In the original plant lay-out the sized materials were distributed to stock-pile storage by four large stackers equipped with 60-ft. loading wings or boom conveyors and running on rails. Two stackers served a stock-pile about 1,200 ft. long and the other two a pile about half that length. The short track sections have now been extended to the same length as the others, so that an area about 500 ft. by 1,200 ft. is now available for storage. A fifth stacker has also been installed and the two tunnels and conveyors formerly reclaiming from the short stock-pile were extended. The trunk conveyor which feeds from the branch tunnel conveyors to the loading building has been extended to serve also a new reclaiming tunnel about 600 ft. long on the far side of the storage. A second wing was added to one of the stackers to serve this storage. Another addition was a sand-storage shuttle conveyor.

The new stone-sand plant of the Blue Ridge Stone Co. at Blue Ridge, Va.

The Chicago Gravel Co. in August installed a terminal for loading barges at its Joliet, Ill., plant. Cars of material are brought from the plant to this terminal and discharged from trestles to a stock-pile. Material is reclaimed by a tunnel conveyor leading to the washing and loading plant at the water's edge and is weighed on the conveyor by a Merrick recording Weightometer. The material is washed over stationary screens.

The Carbon Limestone Co. made extensive improvements to its plant at Hillsville, Pa. Five

Aerial view of the plant of the Inland Lime & Stone Co. at Port Inland, Mich., taken before the recent extension of the storage and reclaiming systems. Many other improvements were also made.

60-ton steel loading bins were added and rotary screens were replaced by vibrating and shaker screens. A Scaife water softener was installed to treat 250,000 gal. of boiler-feed water daily and many other improvements were made.

The Malden Crushed Stone Co., Saugus, Mass., in December installed four Kennedy-Van Saun double-deck screens and made repairs to its screening building which was destroyed by fire at a loss of $50,000 in August.

The Blanton Stone Co., Frankfort, Ky., changed from cars and locomotives to truck haulage in its quarry and installed a double-deck Robins Gyrex screen.

The River Sand & Gravel Co., Owensboro, Ky., made extensive improvements, including the installation of a Clyde Wiley Whirley, a Robins screen and conveying equipment, and a 20-ton Independent truck scale.

W. T. Hardison & Co. added new washing and classifying equipment to their sand-and-gravel plant at Nashville, Tenn. The new equipment included a Niagara screen.

The Blue Rock Quarry, Fayette County, O., installed a new washing plant, a 20-ton Link-Belt locomotive crane and batcher bins.

The France Stone Co. added a Blaw-Knox batching plant at Monroe, Mich., and a New Holland roll crusher for the production of finer sizes of material.

The Piru Rock Co. completed improvements to the crushing, screening and washing departments of its gravel plant at Piru, Cal. A small locomotive and cars were also purchased.

The Standard Slag Co. installed $15,000 worth of equipment at Jackson, O., including new bins and screens. The capacity was increased about 200 tons daily.

The Tygart Limestone Co., Lawton, Ky., installed an Allis-Chalmers crusher and vibrating screen, a Barber-Greene conveyor and a 300-hp. Buckeye Diesel engine.

The Keystone Gravel Co., Dayton, O., added a triple-deck Deister vibrating screen and a New Holland roll crusher. An all-steel dredge with a 10-in. Morris pump was installed by the Schmidt Bros. Sand & Supply Co., Bedford, O. A 2-deck Simplicity screen and a W. H. K. Bennett dewaterer were installed by the Kingston Lake Gravel Co. at Peoria, Ill.

Dolese Bros. purchased and rebuilt a crushed-stone plant at Hartshorne, Okla., making extensive improvements. William Bambi & Sons improved their plant at Norristown, Pa., with two Perfect classifiers, a Tyler Hum-mer screen and a Chambers Bros. clay crusher. The Cerulean Stone Co., Cerulean, Ky., replaced an industrial railway with one International and four Ford trucks. A Symons vibrating screen was also installed. A Kennedy-Van Saun crusher and two screens were installed by the Massachusetts Broken Stone Co. at Stony Brook, Mass. The Blosser Stone Co., Paulding, O., rebuilt its plant and added a 125-hp. Buckeye Diesel engine.

McElwee & Rogy, Peoria, Ill., added two Simplicity vibrating screens to their gravel plant built in 1934. The Allied Supply Co., Medina, O., purchased a 3-ft. by 8-ft. Hardinge counter-current classifier for removing silt and clay from gravel.

The increasing extent to which excavating equipment is being purchased is alone an excellent indicator of the buying spirit now prevalent among aggregate producers. Among the companies purchasing new shovels, cranes or drag-lines are the following: Keener Sand & Clay Co., Columbus, O.; Servtex Materials Co., New Braunfels, Texas; Mt. Vernon Sand & Gravel Co., Mt. Vernon, O.; Liberty Limestone Corp., Rocky Point, Va.; River Products Co., Iowa City, Iowa; France Stone Co., Marion and Silica, Ohio; Blair Limestone Co., Martinsburg, W. Va.; Southland Gravel Co., Greenwood, Miss.; Wm. May Sand & Gravel Co., Waynedale, Ind.; Hersey Gravel Co., Hersey, Mich.

OTHER NONMETALLIC MINERALS in 1935

Lime, Gypsum, Rock Asphalt Producers Make Gains . . . New Plants Start Producing . . Increased Demand for Pre-Mixed Materials Noted.

VARIOUS nonmetallic-mineral industries not discussed in the two preceding reviews include lime, gypsum, rock asphalt, feldspar, phosphate rock, silica sand, etc., and premixed concrete and bituminized aggregates. These industries as a whole fared somewhat better in 1935 than in the preceding year. Production was up in most cases and the stabilized price structures created by the various codes held up fairly well, especially in the lime industry. The renewal of private construction was largely responsible for an increase in production in the lime industry, breaking a steady downward trend since 1926. Other industries dependent on construction and the iron and steel, automobile, glass and other industries which improved during 1935 reflect these conditions. Development of new uses for the products of these industries was also a contributing factor. One such development with apparent future possibilities was the manufacture of a superior synthetic rubber from a mixture of coke, lime and water.

Many new plants were built in these miscellaneous nonmetallic-mineral industries during 1935 and numerous important improvements were made to existing plants. Many plant construction and improvement programs are now under way.

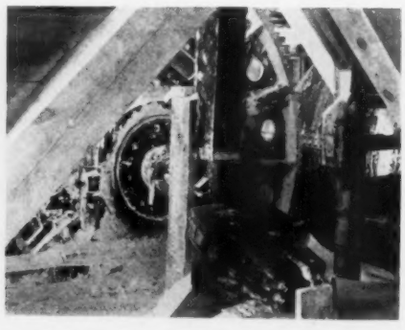
Outstanding among these new plants is that of the Southern Alkali Co. at Lake Charles, La., for the production of caustic soda and soda ash. A part of this operation is one of the most modern rotary kiln lime plants in existence. An unusually efficient burning system is said to have been developed in these kilns.

The Glencoe Lime & Cement Co. completed the first unit of a new plant at Glen Park, Mo., with a shaft kiln of original design. Extensive improvements were made to the plant of the Limestone Products Corp. of America at Newton, N. J. This program included the installation of a Kuntz system of hydrated lime manufacture.

The Longview-Saginaw Lime Works, Saginaw, Ala., made extensive improvements. The United States Gypsum Co. installed additional grinding equipment in its plants at Genoa, O., and Farnams, Mass. The American Lime & Stone Co. continued its program of improvement at Bellefonte, Pa., by the installation of a Traylor rotary kiln. The J. E. Baker Co. installed the Gillette system of lime manufacture at its plant near York, Pa. The National Gypsum Co. plans a $35,000 improvement program at its plant at York, Pa., and the National Mortar & Supply Co., Gibsonburg, O., has let contracts for improvements to cost about $150,000.

An interesting development was the perfection of a putty-aging device which, together with the increase in residential construction, has created a revival of interest in lime-putty plants and central-mixed mortars for bricklaying and plastering. Many lime-putty plants were installed by lime producers in 1935 and plans are under way for their installation by many other producers. Among those who installed such putty plants during the year are: Warner Co., Wilmington, Dela.; Blue Diamond Corp., Los Angeles, Cal.; Galbraith & Co., Seattle, Wash.; Super Concrete Corp., Washington, D. C.

The gypsum industry was revived to a large extent by the increase in private construction and by the development of new uses for its products. Probably the outstanding plant development of the year was the erection by the Victoria Gypsum Co. Ltd., of a new plant in Nova Scotia. Although this would not appear to be an American development it should be classified as such because the company is financed by American capital and shipments will be made to this country. No other new gypsum plants are known to have been built in 1935 but a



New equipment installed in the plant of the Consolidated Feldspar Corp., at Erwin, Tenn. At left and right are two different types of electric vibrating screens. In center is vibrating feeder to conical mill.

contract was recently let by the Newark Plaster Co., Newark, N. J., for the construction of a new gypsum plaster plant at a cost of about $275,000.

An important merger was effected during the year by the National Gypsum Co. and the Universal Gypsum & Lime Co. Shortly after the merger an extensive improvement program was announced which will affect the company's plants at Akron and Clarence Center, N. Y., Luckey, O., Rotan, Texas, Oranda, Va., Fort Dodge, Ia., and National City, Mich. This program, it is estimated, will cost from $400,000 to $500,000. Contracts have already been let for some of this work and a further step has been taken by installing new shovels at three plants.

The Consolidated Feldspar Corp. in 1935 made extensive improvements to its plants at Erwin, Tenn., Keystone, S. D., and Kingman, Ariz. At the Erwin plant three Jeffrey-Traylor vibrating screens, a Tyler 400 screen and 4 Exolon dual magnetic separators were installed. At the Keystone plants a Hardinge mill and two Tyler Hum-mer screens were added. At Kingman, Ariz., an Exolon magnetic separator was installed.

The Kentucky Rock Asphalt Co. in 1935 made a number of improvements to its plant at Kyrock, Ky., which resulted in increased economy of operation. These improvements were described in the September, 1935, issue of PIT AND QUARRY and a complete description of the original plant was published in the June 19, 1929, issue. Production of a new processed rock asphalt was also begun during the year. This allowed utilization of thousands of tons of rock low in bitumen content which had been removed in former years as waste. A new mixing plant was erected at the Bowling Green storage yard of the company where the desired amount of bitumen is added.

At the Kyrock plant a Tyler 400 screen preceding the two roll crushers eliminated the necessity for one of these. Another Tyler 400 screen was installed following the four final roll crushers. These remove caked material from the finished product and feed it to a new Williams hammermill.

A new rock asphalt plant was erected by the Ohio Asphaltic Limestone Co. near Hillsboro, O.

Among the new silica sand plants built were those of the Everton Silica Sand Co., Inc., at Everton, Ark.; the Langworthy Silica Co., Dubuque, Ia.; and the Texas Production Co., Tahoka, Tex. Many other plants were improved and shovels were installed by the Central Silica Co., Zanesville, O., the Pittsburgh Plate Glass Co., Crystal City, Mo., and the Jackson Sand Mining Co., Jackson, O.

A new phosphate rock plant was built at Hernando, Fla., by the Dunnellon Phosphate Mining Co. The American Agricultural Chemical Co. installed a number of Tyler 400 screens and 6 Tyler-Niagara scrubbers at its plant at Pierce, Fla.

The Emeralite Surfacing Products Co., Ely, Minn., is building a new roofing-granule plant to replace the plant destroyed by fire early in 1935 at a $75,000 loss.

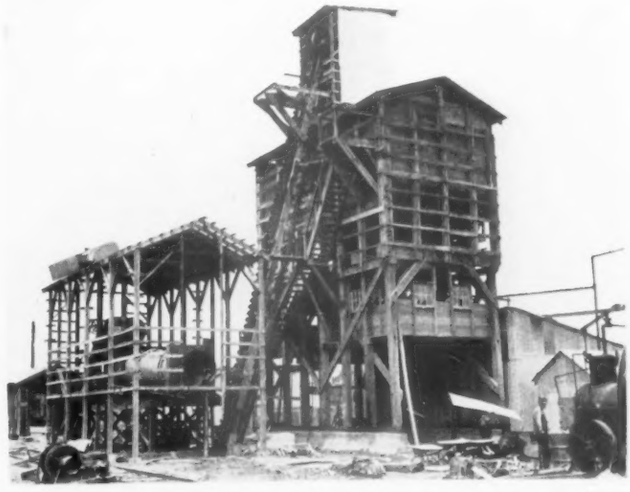
The Minnesota Mining & Mfg. Co. of St. Paul, Minn., carried on an active expansion program. This company in 1935 purchased the roofing granule plant of the Funkhouser Co. and the crushing plant of the Columbia Silica Co. at Akron, O. A new warehouse and storage building is being erected and other improvements are under way at the company's plant at Wausau, Wis., at an estimated cost of $250,000.

The Georgia Kaolin Co. in 1935 installed its fourth Christie drier at Dry Branch, Ga. The Mineral Products Co., Ochlochnee, Ga., purchased a new 1¼-cu.yd. shovel.

A new bentonite plant is under construction by the Filtrol Co. at Jackson, Miss. The American Colloid Co. installed a Bonnot disintegrator at its bentonite plant at Lead, S. D.

The Dulassen Diatom Products Corp., Solvang, Cal., built a new diatomaceous earth plant with a capacity of 50 tons per 8-hr. day. The Floridin Co. purchased a 1¼-cu.yd. shovel for its fullers' earth plant at Quincy, Fla.

Celo Mines, Inc., put into operation a new commercial kianite plant near Burnsville, N. C. The Basalt Rock Co. erected a new pumicite plant at Napa, Cal. A new type of building block is being made from this material. A new rock wool plant was built by the Mineral Insulation Co. at Chicago, Ill., and the Western Rock Wool Corp. is erecting a new plant at Huntington, Ind.



View of aggregate-bituminizing plant of Colprovia Road Products, Inc., at Columbia, S. C., showing main elevator in center and drier being installed at left.

Standard Minerals, Inc., Hemp, N. C., completed a new pyrophilite plant near its older plant. A Dorr bowl classifier and a Traylor conical mill are among the major equipment units.

The production of bituminized aggregates is rapidly becoming a recognized function of the aggregate producer and many new plants of this type were erected during the year. The evident advantages of producer-operated bituminizing plants has resulted in a definite trend toward the almost exclusive location of new permanent bituminizing plants at the sources of aggregate supply.

Aggregate and cement batching and weighing equipment in the concrete central-mixing plant of the Columbia Construction Co. at Bonneville Dam, Wash.

A typical producer-operated aggregate-bituminizing plant was the one erected by Colprovia Road Products, Inc., which was described in the October, 1935, issue of PIT AND QUARRY. Major equipment in this plant includes a 5-ft. by 30-ft. Hetherington & Berner rotary drier-cooler, a Hedges-Walsh-Weidner 1-ton aggregate-weighing batcher and a pug-mill mixer of the same capacity and make. This plant has a capacity of 30 tons per hr.

Many other producer-operated aggregate-bituminizing plants were also built in 1935. The General Crushed Stone Co. installed new plants at Worcester, Mass., and Oaks Corner, N. Y. A Niagara screen and a Pratt-Daniel dust collector are used in the Worcester plant. The Plattsburgh Stone Products Co., Plattsburgh, N. Y., installed a complete 2-ton capacity Cummer plant. A complete Hetherington & Berner aggregate bituminizing plant was installed by the Stewart Sand & Material Co., Kansas City, Mo.

The ready-mixed-concrete industry in 1935 showed activity reminiscent of pre-depression days. Conditions have changed considerably in the intervening years, however, and most commercial operators are now installing batching plants and using truck-mixers instead of the central-mixing plants formerly popular. Most of the large central-mixing plants now built are for large construction projects.

The Koenig Coal & Supply Co., one of the largest gravel producers in Michigan, erected a concrete-batching plant at its Detroit yard. Butler bins and ten 4-cu.yd. Jaeger truck-mixers are used.

Cement-blending plant operated by the Metropolitan Water District of Los Angeles at Fargo Canyon on the Los Angeles aqueduct.

The Minnesota Sand & Gravel Co., Minneapolis, Minn., installed batching equipment and purchased a fleet of 11 Jaeger truck-mixers.

The Maule-Ojus Rock Co., Miami Beach, Fla., installed a storage and batching plant and purchased a fleet of Blaw-Knox truck-mixers mounted on Ford V-8 chassis. The plant has a capacity of 250 cu.yd. daily.

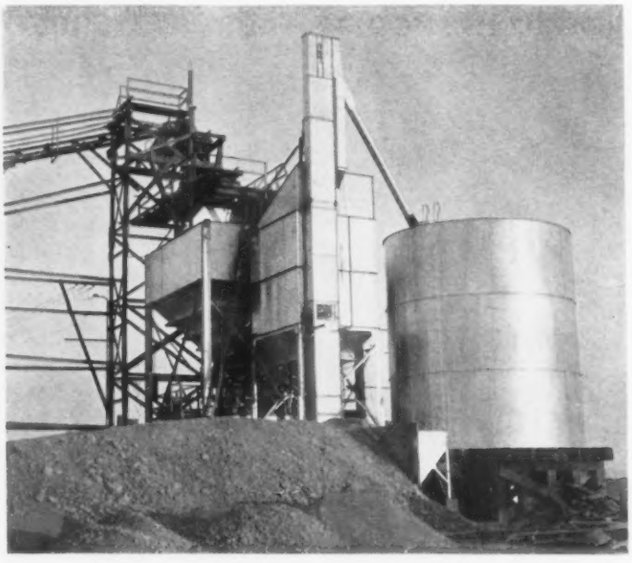
The Builders' Material Co., Cedar Rapids, Ia., operator of permanent and portable aggregate plants, installed Johnson bins and batchers and several Jaeger truck-mixers.

The Soo Sand & Gravel Co., Sault Ste. Marie, Mich., added two Jaeger truck-mixers; W. M. Dabney, Inc., Miami Beach, Fla., added four Jaeger truck-mixers; the Buffalo Gravel Corp., Buffalo, N. Y., added a fleet of mixers mounted on Chevrolet trucks; and the Warner Co., Philadelphia, Pa.,

Part of fleet of 30 truck-mixers used by the Maloney Concrete Co., Washington, D. C.

added ten Mack truck chassis on which are mounted revolving-drum agitators.
on which are mounted revolving-drum agitators.

The Super Concrete Corp., Washington, D. C., purchased 16 new Chain-Belt Rex 3½-cu.yd. truck-mixers, making a total of 49 truck mixers now operated by this company. The Maloney Concrete Co., Washington, D. C., added 10 Jaeger truck-mixers mounted on General Motors chassis, making a total of 30 now operated. Graham Bros., Los An-



Cement-and-aggregate-batching plant operated in connection with E. M. Hawley aggregate plant No. 2 on the Los Angeles aqueduct.

geles, Cal., early in the year purchased 25 new International trucks of 2½- to 10-ton capacity on some of which new Jaeger mixer bodies were mounted. The remainder of these trucks are used for handling aggregate and cement.

Large and complete concrete central-mixing plants were erected during 1935 on many large construction projects. Outstanding among these are the plants furnishing concrete for the Grand Coulee

One of the new trailer-type truck mixers being operated by Graham Bros., Los Angeles, Cal.

Dam in Washington which are completely described in this issue. The plants used at the Fort Peck Dam in Montana were described in the November, 1935, issue of PIT AND QUARRY.

At Bonneville Dam, Wash., the Columbia Construction Co. erected a plant to supply concrete for this project. An elaborate system of batching is used to supply the four 5-cu.yd. T. L. Smith concrete mixers. Operation of this plant began late in September.

A variety of types of mixing and batching plants are used on the various contracts on the 300-mi. aqueduct being built by the Metropolitan Water District of Los Angeles, Cal., to supply water from the Colorado River to the Los Angeles area. Several of the aggregate- and cement-batching plants operated by the district and by contractors are illustrated.

Grand Coulee Dam (from page 65)

tives on both levels haul the cars over the steel-trestle bridges to the place of pour.

Four double cantilever gantry cranes made by the Colby Steel & Engineering Co., Seattle, and four Clyde Gantry cranes handle the concrete buckets and place the concrete. All these units operate on 28½-ft. gage tracks. Under these cranes are three standard-gage tracks, one used for loaded cars, one for empty cars and one for unloading. This system provides an uninterrupted flow of concrete to the cranes.

The construction of Coulee Dam, planned to be about three times as big as Boulder Dam, until now

One of the shovels used in excavating the dam site loading a tractor-drawn wagon.

the world's largest concrete dam, also made history because of the methods used in excavating for the dam. A total of 1,500,00 cu. yd. was first removed under separate contract and over 10,000,000 cu. yd. more have since been removed by the M. W. A. K. Co. Excavating and loading of this material is done by Diesel and electric shovels. There are 11 Bucyrus-Erie shovels ranging up to 5 cu. yd. capacity. Motor trucks and various types of tractor-pulled dump wagons and buggies haul the excavated material to tributary conveyors equipped with grizzlies which remove bowlders. These are hauled to the dump separately by trucks. The excavated material passing the grizzlies is fed by the tributary conveyors to the main disposal conveyor which discharges to the waste disposal dump. This system is made up of 19 sections of 60. in. conveyors totaling over 5,600 ft. in length. This system has handled 51,000 cu. yd. in a 21-hr. day.

Lepol Kiln System Heads List of Improvements at This Cement Plant

By W. E. TRAUFFER

Plant of Spokane Portland Cement Co. with new cement-storage silos in foreground.

A CEMENT plant development which has created an unusual amount of interest among cement manufacturers is the installation by the Spokane Portland Cement Co., Irvin, Wash., of a Lepol kiln, the first of its kind on the North American continent. While the Lepol kiln has been widely used for many years in Europe and other parts of the world, this is the first opportunity for American cement men to study its operation under the conditions existing in this country. That its success in this plant has exceeded expectations intensifies its interest. Many other important improvements were made at the same time and this is now one of the most efficient and modern plants in the country. This program was completed late in August, 1935.

This plant was originally built by the Fuller Engineering Co. for the International Portland Cement Co., Ltd., and went into operation in 1912. At that time it had a capacity of 1,500 bbl. daily. In 1932 local capital obtained control of the company and the name was changed to the Spokane Portland Cement Co.

Before the recent improvements were completed only a few changes of importance had been made in the plant. The kilns had been unchanged since the plant was built. The original finish-grinding Fuller mills were replaced in 1920 by an Allis-Chalmers Compeb mill and those in the raw-grinding department were replaced in 1927 by a Hardinge conical mill. Other equipment added included Schaffer Poidometers for blending the raw-material, Sly dust-collectors in the stock-house, Hummer screens for closed-circuit finish grinding, a Turboclone, etc. A Symons crusher was installed in 1928.

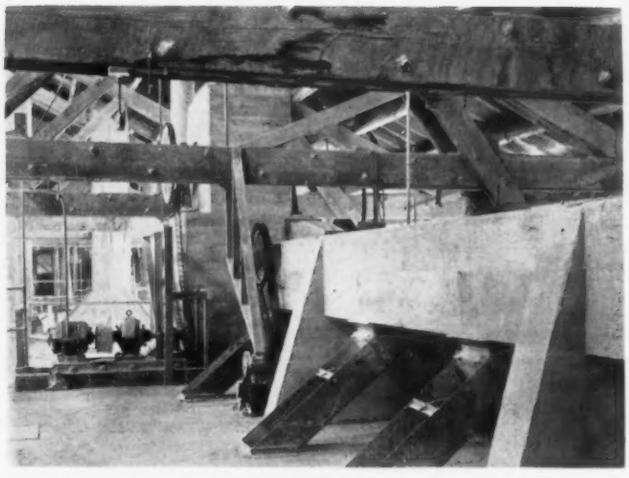
The recently-completed improvement program included, in addition to the Lepol kiln system, a number of other important installations. A Babcock & Wilcox Type B pulverizer was installed for finish-grinding with provisions for raw grinding as well. A Sturtevant separator is used in closed circuit. Stephens-Adamson Redler conveyors were installed for handling raw material and for reclaiming cement from the old storage bins to the new pack-house. A new Schaffer Poidometer feeds the new B&W mill and Hardinge constant-weight feeders are used for proportioning the clinker and gypsum. Polysius Cera pumps were installed to convey raw ma-

Left to right: R. K. Neill, pres.; H. M. Heleniak, v.-p.; G. M. Bell, sec.-tr.; Walter B. Neill; Frank D. Neill, supt.; all of the Spokane Portland Cement Co.

The plant of the Spokane Portland Cement Co. at Irvin, Washington, with new raw-material blending silos in center. Behind these are the new cement-storage silos.

terial to the new raw-blending silos, to convey finished cement from the B&W mill to the new cement-storage silos and to reclaim cement from these silos to the new pack-house. Polysius aërating systems were also installed in the new raw-material and cement storage silos and a Sullivan air compressor was added to supply air for these and the Cera pumps. A Polysius cooling system was installed in the existing rotary cooler serving the Lepol kiln. Many new electric motors were also added to the plant equipment. Most of this equipment was fitted into existing buildings but new raw-material and cement storage silos and a new pack-house were erected.

The quarry from which raw material for this plant is obtained is at Powell Spur on the Columbia River 110 mi. northwest of Spokane. It is a typical open-face quarry and conventional drilling and blasting methods are followed. Blast-hole drills are used and the stone is loaded by a 1½-cu. yd. Marion electric shovel into White 5-ton trucks of

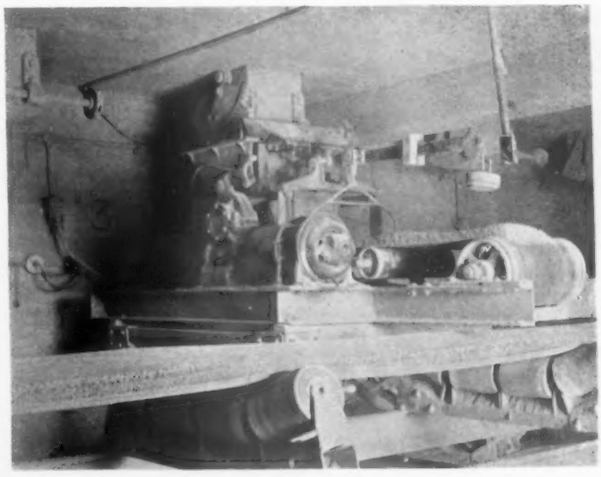


The concrete-inclosed continuous-flow conveyor which distributes raw material to storage bins.

which there are two. These trucks haul the rock to the crushing plant. A Traylor primary jaw crusher and two Allis-Chalmers gyratory crushers are used. Shale is obtained from the same quarry.

The great height of the quarry level over the railroad level necessitated the use of an unusual system of handling and storing the crushed rock and shale. Three raises were driven down from the quarry level and these are used for storage, two for rock and one for shale. Dump cars are loaded in a tunnel under these raises and are hauled by electric locomotives. Their contents can be discharged either direct to railroad cars or to concrete storage bins of 10-car capacity which were built several years ago.

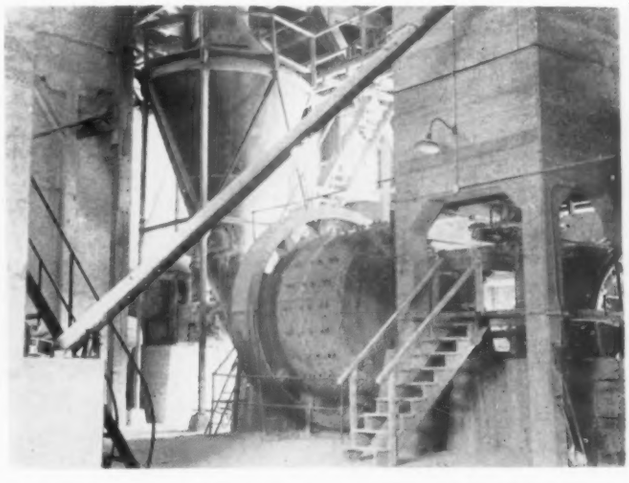
At the cement plant the cars discharge the rock and shale from a concrete trestle to stock-piles. A belt-conveyor reclaims these materials through a tunnel and discharges them into a 7-ft. by 70-ft. Vulcan rotary drier. A Tyler Hum-mer screen removes the fines from the feed to a Symons 4-ft. cone crusher, the discharge of which is fed by an elevator to two Hum-mer screens from which the coarse material can be fed back to the cone crusher or to a set of rolls. The crushed material is fed to a 9-in. Stephens-Adamson Redler conveyor which is horizontal and operates on 67½-ft. centers. This unit is concrete-inclosed and has a capacity of 50 tons per hr. It discharges into 12 concrete storage bins having a capacity of 100 tons each.



One of the four movable measuring feeders which are used for blending raw materials.

Below these bins are four Schaffer Poidometers which are set on portable mountings and allow any desired blending of the materials to be made. These discharge to a belt conveyor and an elevator discharges into a 15-ton capacity bin over the Hardinge 66-in. by 10-ft. conical raw-grinding mill. This is supplied with material by a Hardinge constant-weight feeder. This mill is grinding 17 tons per hr. to 88 per cent. through 200-mesh. It is driven by a 500-hp. General Electric motor.

The Hardinge mill operates in closed circuit with a cyclone separator which returns the coarse material to the mill. The separated product is discharged into two of six 70-ton capacity bins equipped with Polysius air-pressure back filters which retain the pulverized raw material while releasing the air to the atmosphere. Suction for this



The 66-in. by 10-ft. conical raw-grinding mill with constant-weight feeder at right.

One tank of the 2-tank pump which handles pulverized raw material for storage and blending.

grinding system is provided by a No. 100 Clarage fan. Samples are taken at these bins every 4 hr. to control the blending of the raw material later in the flow.

A Size 18 two-tank Polysius Cera pump draws the pulverized material from 2 of these 6 bins and feeds any of 8 bins, 4 of which are part of the

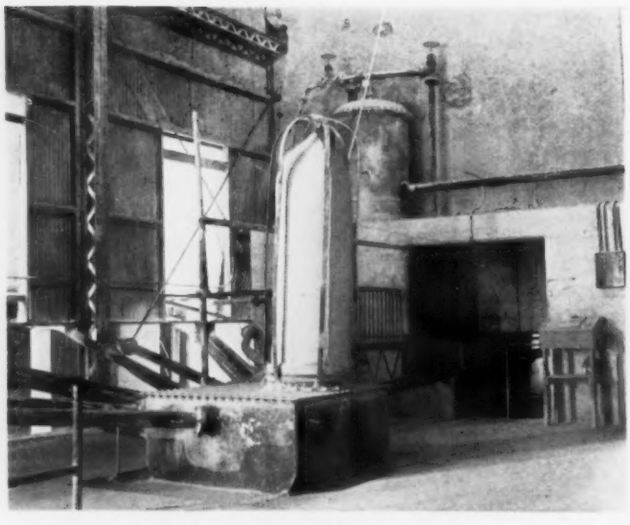
Valves and pipe lines for reclaiming from raw-material silos and for aerating this material.

series of 6 bins and 4 of which are new reinforced-concrete raw-material silos, which are 20 ft. in diameter and 46 ft. high. Polysius aërating systems keep the material in each silo or bin in suspension after the silo has been filled, mixing it thoroughly. The same Cera pumping unit can withdraw the material from any one of the 8 silos or bins or from several silos or bins in the desired proportions to secure a perfect blend and feed it to any of these 8 bins or silos. It can also feed direct to the kiln or from any blended bin to the kiln. The Polysius aërating systems in these bins and silos insure the free discharge of their contents. The Cera pump feeds the blended raw material to a steel raw material storage bin. A screw conveyor feeds from the bin to a bucket-elevator which in turn feeds the raw material to a screw conveyor which has a perforated trough that removes any lumps or impurities that may be present. The raw material is discharged by this screw into the nodulizer-feed hopper which is so arranged that any material in excess of the requirements overflows by gravity into the storage bin.

The nodulizer is a standard Polysius unit 7 ft. 6 in. in diameter and 14 ft. long. It is a rotating drum which agitates the raw material in a spray of water, causing it to form nodules averaging ½ in. in diameter. A moisture content of 14 per cent. has been found most satisfactory with this raw material. The nodulizer is driven through a ring gear by a 30-hp. Wagner motor connected to a Western speed-reducer. This motor has a 12-speed control. The nodulizer feeder is driven by a 3-hp. Wagner gearmotor. Actual power required for the nodulizer and feeder is 24 hp. and ¾ hp., respectively.

The nodules are discharged into a hopper which has sufficient capacity for one hour's operation of the kiln. From the hopper the nodules are discharged by gravity to the traveling grate of the Lepol unit. The nodulized material is carried on this grate through the drying and burning chambers of the Lepol unit where the hot gases from the rotary section of the kiln are drawn downward through the grate and the bed of nodules. Draft is supplied by an 80-in. Bayley Type B fan which is driven by a 75-hp. Wagner motor and has a 10-speed control. At the present capacity of 50 bbl. per hr. this actually requires 65 hp.

This Lepol kiln unit is similar to others previously installed but incorporates a number of improvements. The traveling grate which carries the nodules is 7½ ft. wide and operates on 37-ft. centers. It consists of 6 rows of heat-resisting cast-iron plates, with ¼-in. by 4-in. perforations, connected to 4 rows of chain. The grate is driven by a 7-hp. motor through a Western gear reducer having a ratio of 1-to-50 and a worm gear with a 1-to-60 ratio. The grate actually requires only 3 hp. under full load. It is being operated at present at a speed



Air-pressure back filter for the pulverized raw-material aerating system.

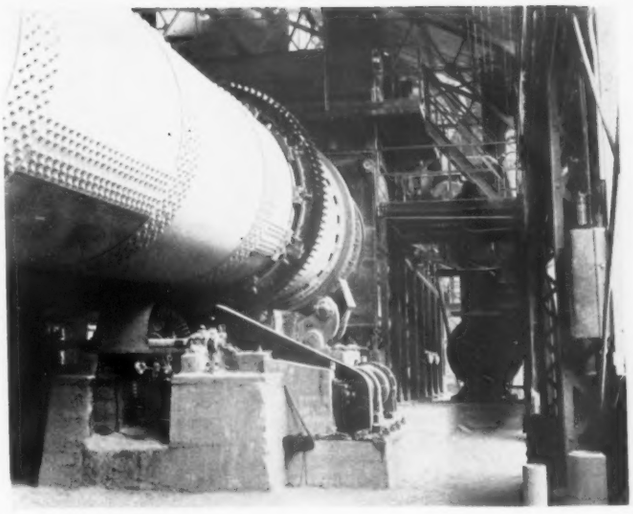
of 60 ft. per hr. but this can be varied as desired between the limits of 40 to 80 ft. per hr.

The Lepol kiln housing is extended downward in hopper form inclosing the return flight of the grate. This arrangement prevents the ingress of cold air and any loss of material adhering to the grate besides making the unit dustless. Close-fitting horizontal side-sealing guide plates of chrome cast steel cut down the loss of material from the grate. A drag-chain conveyor 5½ in. wide and operating on 54-ft. centers reclaims any material lost from the grate at the base of the hoppers. This conveyor is driven by a 6-hp. motor through a Falk speed reducer and chain but actually uses only a small fraction of this power. The collected material is discharged to the bucket elevator feeding the sieve screw ahead of the nodulizer.

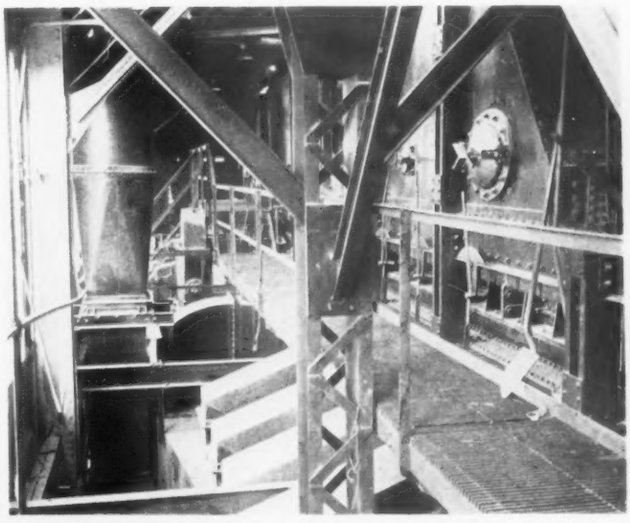
The drying and burning zones in this kiln are of the same size. In the former a temperature of 600 to 700 deg. F. is maintained and in the latter it ranges between 1,600 and 1,800 deg. F. The efficient transfer of heat to the nodulized raw material in the Lepol kiln is evident from the fact that the gases enter the Lepol unit from the rotary kiln at temperatures between 1,600 and 1,800 deg. F. and are drawn from the traveling grate at an average temperature of about 250 deg. F. The exhaust or draft fan handles 27,000 cu. ft. per min. and discharges through a 3-ft. 4-in. by 60-ft. steel stack to the atmosphere at about 200 deg. Calibrated levers control the draft and the air volume in each chamber.

As the hot air entering the Lepol unit passes through the burning section part of it is drawn downward through the traveling grate and the remainder is diverted by a baffle plate into a passage leading to the drying section. This passage is equipped with a vent fitted with a damper which controls the entry of any desired amount of cold air to regulate the temperature in the drying zone. The air drawn downward through the grate in both sections goes to the kiln stack.

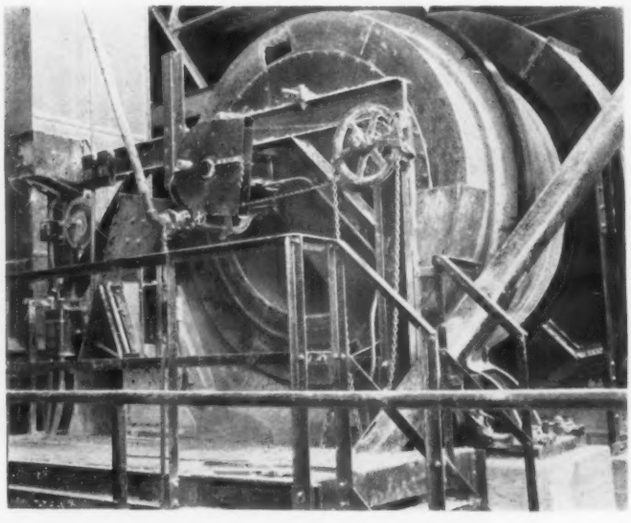
No special heat-resisting metals are used in the Lepol unit but chrome cast steel and cast iron are widely used. The use of these metals has eliminated the water-cooling jackets around the burning and drying chambers which were used in older installations. Water cooling is now employed only on the grate drive shaft through cast-iron housings around the shaft at the three bearings. Two scrapers which keep the material from adhering to the grate are also fastened to a water pipe.



The new grate-type addition to the rotary kiln with kiln draft fan at right.



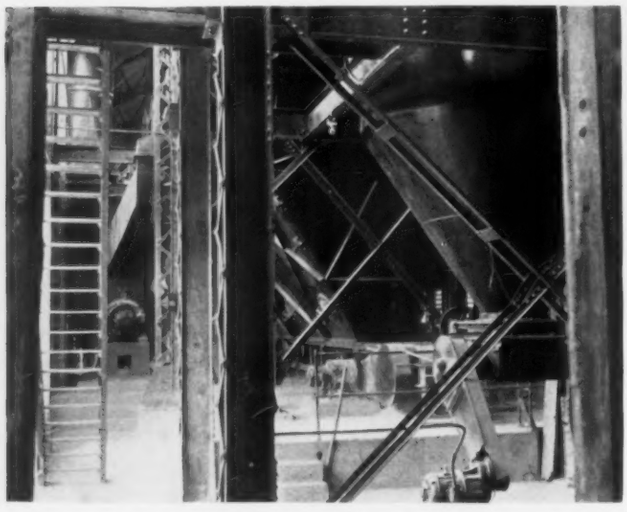
Another view of new kiln installation with draft fan at left and grate drive in background.



The machine which forms kiln feed into nodules of about ½-in. diameter.

The Lepol unit was guaranteed by the Polysius Corp. to produce 1,000 bbl. of standard Portland-cement clinker in 24 hr., using not more than 680,000 B.t.u. per bbl. This guarantee was exceeded shortly after the kiln went into operation. The latest figures available are those for the first half of November during which the kiln averaged 1,200 bbl. of modified-Portland-cement clinker in 24 hr. with a fuel consumption of 46 lb. of 12,500-B.t.u. coal or 575,000 B.t.u. per bbl. On Nov. 13 the kiln had been in operation for 81 days with no difficulties of any kind. Previous to its conversion, the kiln capacity averaged 800 bbl. of standard Port-

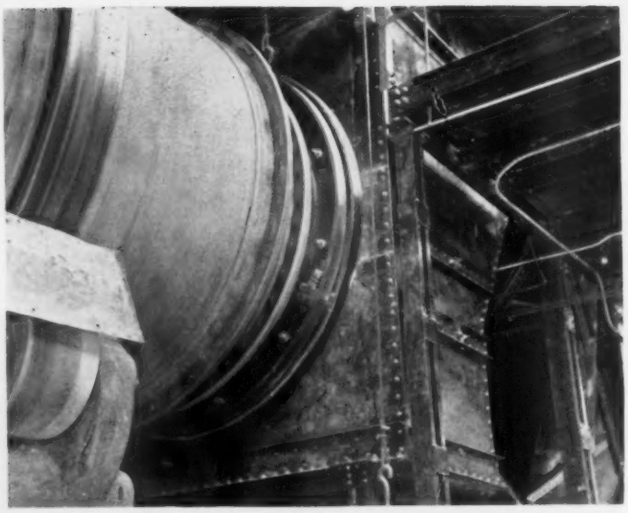
land cement in 24 hr. with a fuel consumption of over 100 lb. of coal per bbl. Better grindability of the clinker produced also resulted in a marked increase in the grinding capacity of the finish-grinding mill. Records kept at the plant show that the average capacity of the mill increased about 15 bbl. per hr. or about 19 per cent. when operations were switched from rotary kiln clinker to Lepol kiln clinker. At the same time average power consumption by the B & W mill motor decreased about 13 per cent. These gains were qualified by very slight decreases in average particle fineness and a considerable decrease in average surface area. In balancing the above factors it should be remembered that the storage clinker ground was cool, dry and seasoned while the Lepol kiln clinker was green and was fed to the mill at the temperature at which it came from the cooler. The above figures are averages taken from days on which no delays due to adjustments of related equipment, etc., kept the mill from operating at its highest efficiency.



Raw-material bin preceding kiln at right. Beyond this are hoppers under grate section of kiln.

The partially calcined material is discharged from the grate of the Lepol unit through a chute into the 8½-ft. by 100-ft. rotary kiln which is connected to the housing of the Lepol unit by a Polysius counterweighted seal ring. This kiln is one of the two original 160-ft. Vulcan kilns installed when the plant was built 22 years ago. To make it fit the new arrangement a 60-ft. section was cut from the d'scharge end of the kiln, eliminating the tire on that end. The entire remaining section of the kiln was then moved 45 ft. so that each of the three remaining tires now rests on the rollers formerly supporting its adjoining tire and the new discharge end is in the same place as the old. In this way the structural balance of the kiln was retained without moving any of the three tires on the kiln shell. A new kiln hood was installed and this is also fitted with a Polysius seal ring. The original kiln drive of a 30-hp. General Electric motor and Wm. Ganschau reducer has been retained but a chain drive has been substituted for the former flat belt.

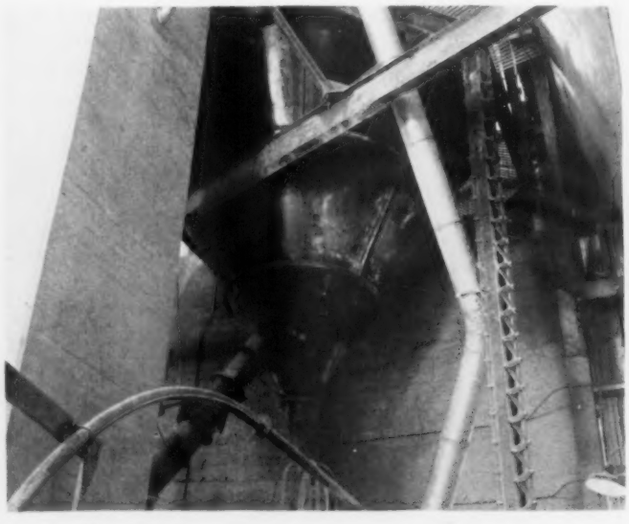
The kiln was shut down during the latter part of December to permit installation of 20 ft. of General Refractories Co. Ritex "A" magnesite brick in the burning zone of the rotary section. Operations are expected to be resumed early in January.



Seal ring connecting rotary section of kiln to new grate section.

The kiln control board on the burning floor gives remote control of all operations connected with the kiln except for the hand control of the draft at the Lepol unit. The instruments on this board include 3 draft gages, 3 temperature recorders, a CO_2 gage, ammeters, etc.

The coal used in this plant is dumped from a concrete trestle to a stock-pile, from which it is recovered by a tunnel belt-conveyor. It is passed through a 5-ft. by 30-ft. Vulcan rotary drier and is ground by two 42-in. Fuller mills. A series of elevators and screw conveyors feed the pulverized coal to the two kiln-feed tanks.



The 16-ft. mechanical and air separator which classifies finish-grinding mill product.

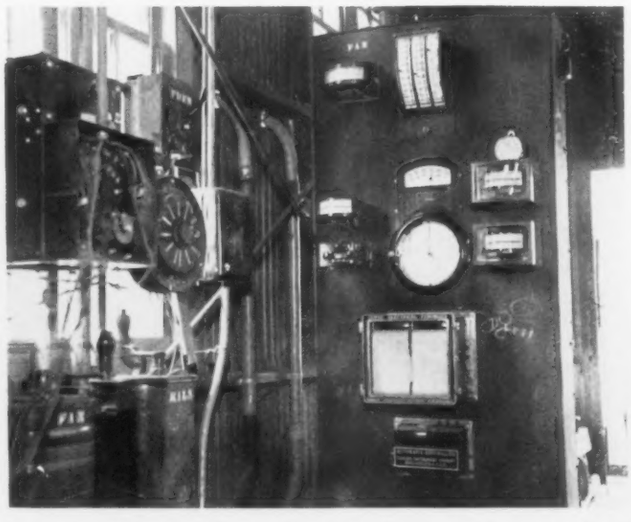
A Polysius coal feeder is used on the Lepol kiln. Two paddle-type agitators insure a steady flow of coal to a star feeder which moves the coal into the burner air stream. Air is supplied at 1-ft. to 2-ft.

water pressure by a Roots-Connersville constant-pressure blower which has a pressure range up to 5 ft. A water-jacketed steel burner nozzle is used.

The original 7-ft. by 70-ft. rotary clinker cooler has been retained, but a Polysius cooling system, consisting of lifters and cells, has been installed to increase its efficiency. In order to install this system it was necessary to cut 5 ft. off the length of the cooler. A new concrete-and-brick inlet head and a Polysius seal ring were also installed. This cooler is preheating air to a temperature of from 1,200 to 1,300 deg. F. and cooling the clinker to 350 deg. F.

The other kiln and cooler have been practically unchanged since the plant was built. Although not in use at present they are kept ready to operate at any time. The original mechanical handling system which formerly fed both kilns was left in place and now feeds the remaining rotary kiln. This system can also be used to feed to the nodulizer feed hopper. This system consists of two opposed-flight screw conveyors which reclaim from any of the six bins to a third screw conveyor. This discharges to the same bucket elevator which feeds the nodulizer. This elevator has a split discharge which permits feed either to the nodulizer or to a 200-ton capacity steel tank. A screw conveyor feeds the raw material from the tank to the 8½-ft. by 160-ft. kiln from which the clinker passes to the 7-ft. by 70-ft. rotary cooler and into the same flow as the clinker from the Lepol unit.

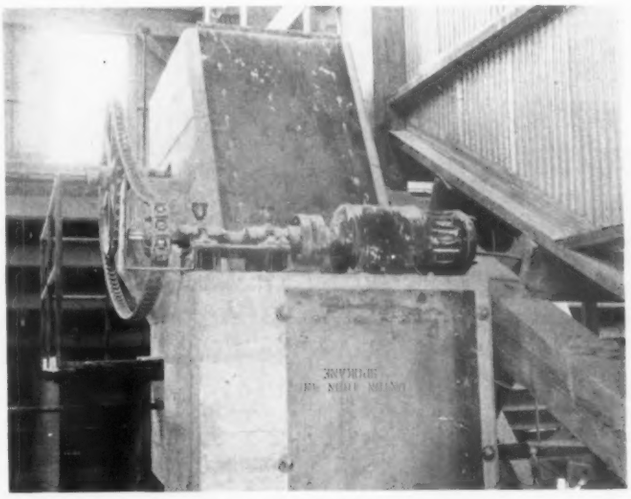
Clinker is discharged from the two coolers to a



Instrument board and controls for the improved kiln and related equipment.

bucket-elevator which can discharge direct to live storage piles or to a belt-conveyor for distribution to dead storage. This system makes possible a storage capacity of 30,000 bbl. A drag-line is used to reclaim clinker to a feed opening, from which a Hardinge constant-weight feeder discharges it to a 20-in. by 360-ft. collecting conveyor operating in a concrete tunnel. Goodrich belting is used on this conveyor and an American Air Filter Co. Rotoclone keeps the tunnel free of dust.

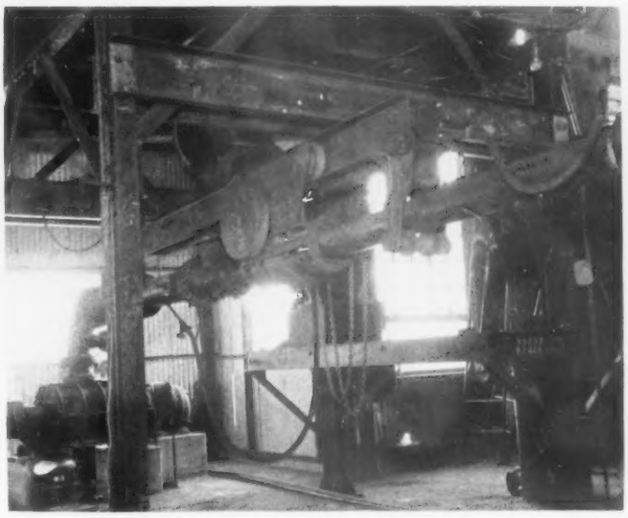
Gypsum is received in box-cars from Hanover, Mont., and is unloaded on a belt-conveyor which discharges it to a 3-carload concrete storage bin. Another Hardinge constant-weight feeder discharges the gypsum on the tunnel conveyor which also handles the clinker in the desired proportions. The two feeders and the belt-conveyor are interlocked so that if either feeder stops, the other feeder and the conveyor are automatically stopped. In addition the elevator to which the belt-conveyor dis-



Motor-reducer and chain drive of elevator feeding from finish mill to separator.

charges must be in operation before the feeders or conveyor can be started.

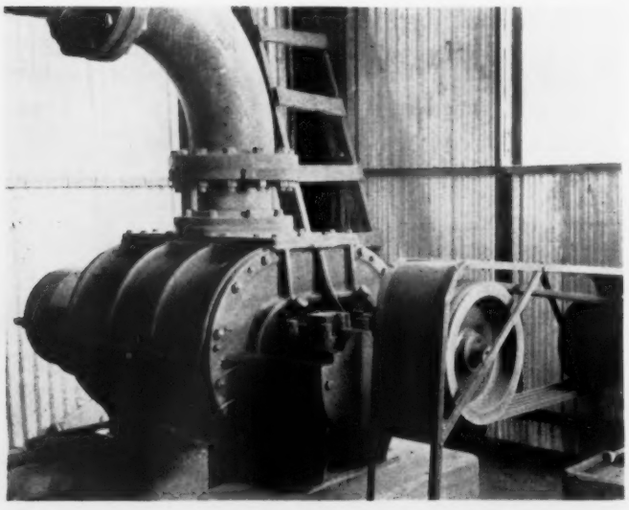
This elevator discharges the material into a 30-ton concrete bin, from which a 30-in. Schaffer Poidometer feeds it to a Babcock & Wilcox Type B Size 360 mill. The Poidometer is automatically interlocked with the mill so that any overload on the mill motor cuts down the rate of feed and *vice versa*. In this way the mill is kept operating at its highest efficiency and a uniform product is assured. The mill discharges to a Link-Belt bucket-elevator which operates on 60-ft. centers and discharges into a 16-ft. Sturtevant separator. Coarse material is



Coal-feed system for the improved kiln with constant-pressure blower in background.

returned to the mill by gravity to be reground and the finished cement is fed by gravity to a storage tank feeding a Cera pumping system. The entire grinding system is vented through a 2-ft. cyclone at the pump-feed hopper.

The Babcock & Wilcox mill is so arranged that it can also be used for raw-material grinding. A pipe connected to the raw-grinding mill-feed bin can discharge to the elevator which now feeds clinker and gypsum to the finish-grinding mill-feed bin. A split-chute arrangement allows discharge to a second 30-ton bin compartment which is reserved for raw material. The same feeding and separating equipment is also used and the fines go to the same Cera pump which handles the raw material, by means of a two-way valve, direct to the four silos previously mentioned. The two 10-ton bins and the Cera raw-material pump can also be included in this flow if desired.



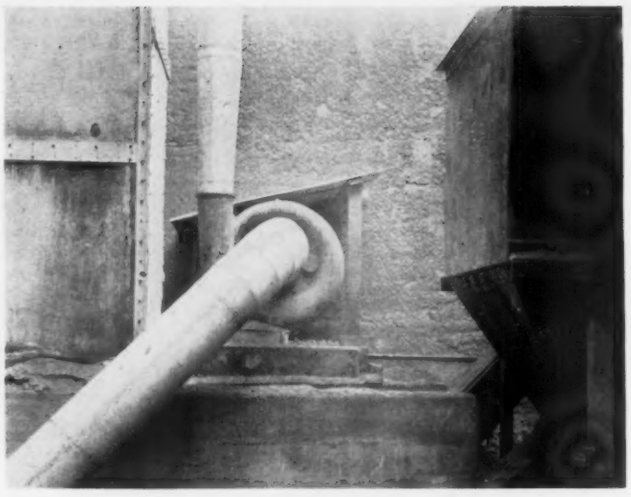
The constant-pressure blower which supplies primary air to kiln.

The Babcock & Wilcox mill went into operation early in August. After the usual preliminary adjustments were made the mill operated on standard Portland-cement clinker which had been produced by the rotary kiln before the Lepol unit was installed and was taken from storage. With the exception of a few delays for adjustments to the mill, separator or other related equipment the mill operated steadily on this material until September 10 when the Lepol kiln was started.

On September 10 the mill commenced grinding standard Portland-cement clinker produced by the Lepol kiln mixed with some rotary kiln clinker taken from storage and continued to grind this material until October 4, when grinding of modified Type B clinker for the Grand Coulee Dam was begun.

On October 4 the mill commenced grinding modified Type B cement clinker produced by the Lepol kiln and has operated steadily on this material ever since. Complete operating data are available up to and including December 2.

The accompanying table is divided into three sections: the first showing the results obtained in grinding standard Portland-cement clinker produced by the rotary kiln and taken from storage;

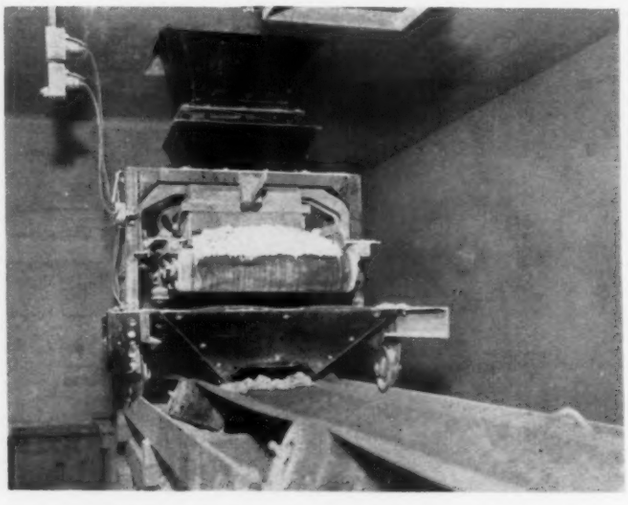


Rotary type of dust collector which serves clinker-reclaiming tunnel. Clinker elevator at left.

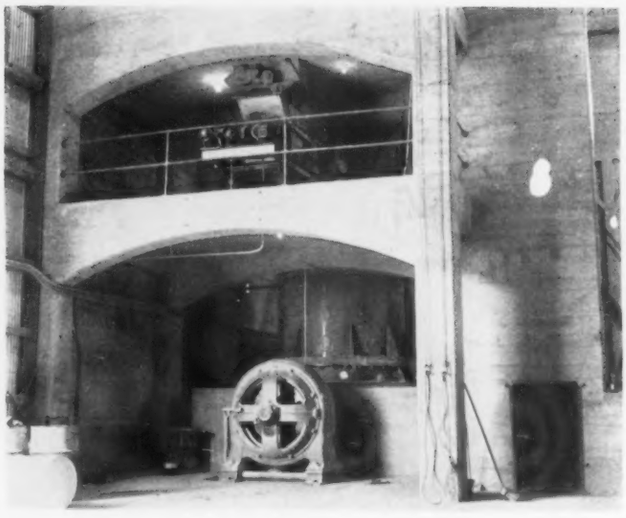
AVERAGE OUTPUT AND POWER CONSUMPTION OF BABCOCK & WILCOX MILL AND AVERAGE FINENESS AND TIME OF SET OF PRODUCT

	Production (*bbl. per hr.*)	Power Consumption (*kw-hr. per bbl.*)		Fineness		Time of Set	
		Mill Only	Mill, Elevator and Separator	(% *through 200-mesh*)	(% *through 325-mesh*)	Initial *hr. min.*	Final *hr. min.*
Standard Portland-Cement Clinker from Storage	79.26	3.94	4.85	95.23	91.7	3 10	5 11
Standard Portland-Cement Clinker from Storage and Lepol Kiln	90.39	3.66	4.48	95.88	92.1	3 24	5 19
Modified B Portland Cement Clinker from Lepol Kiln	54.89	5.51	6.41	99.3	97.6	2 50	5 9

the second showing the results obtained in grinding a mixture of the same material and standard Portland-cement clinker from the Lepol kiln; the third



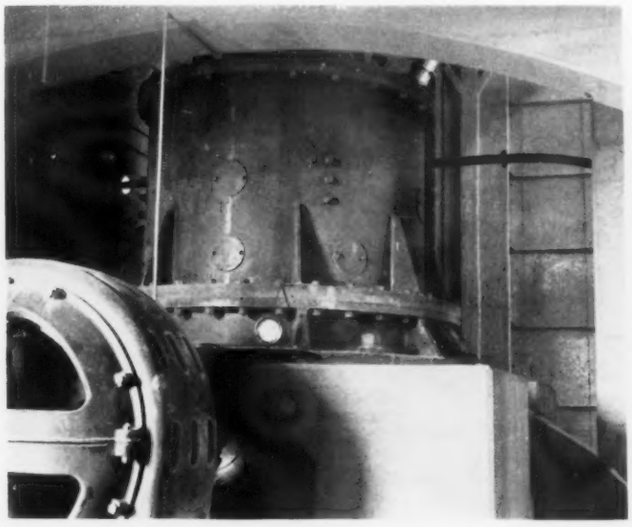
Constant-weight feeder discharging gypsum to conveyor to finish-grinding mill.



Arrangement of weighing feeder and finish-grinding mill.

showing the results obtained in grinding modified Type B clinker produced by the Lepol kiln.

The figures given in the table for each period are averages for the entire period. Because of a number of shutdowns for adjustments, etc., on many of these days these figures do not do justice to either the mill or kiln. An average of results on selected days on which there were no delays would be considerably more impressive.



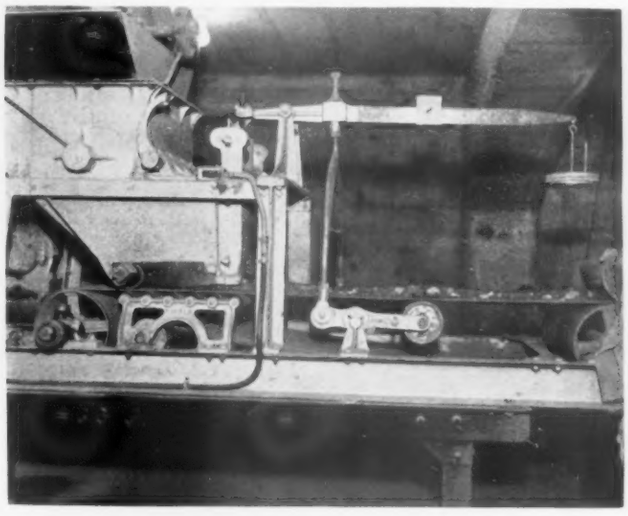
The ball-bearing type finish-grinding mill with its 400-hp. motor.

On the mixture of standard Portland-cement clinker from the rotary and Lepol kilns the guarantee was greatly exceeded as to both output and fineness. During the period when this material was ground the average production was 90.39 bbl. per hr. and the average fineness 95.88 per cent. through 200-mesh.

When the mill was switched from standard Portland-cement clinker to modified Type B cement clinker for Coulee Dam no changes were made in the mill or separator settings as would usually be done for any prospective changes in grindability or other characteristics of the material. When the first results on the operation of the mill and separator on this cement were available, it was recognized that the government specifications were being greatly exceeded on fineness, strength and setting time, which are the three factors on which the government tests for modified Type B cement are based. However, because this cement represents a new product for this plant and is subject to strict government testing methods the cement company preferred to operate at the higher fineness even at a sacrifice of output.

A measure of the extent to which the requirements are being exceeded is indicated by the fact that government specifications require a minimum compressive strength in 7 days of 1,500 lb. Government-test reports show that the actual average strengths are running over 4,350 lb. The required minimum surface area is 1,800 and the actual average obtained is 1,982. Limits for the times of initial and final set are not less than 30 min. and not more than 10 hours, respectively. Government-test results show an initial set of about 3 hours and a final set of about 6 hours.

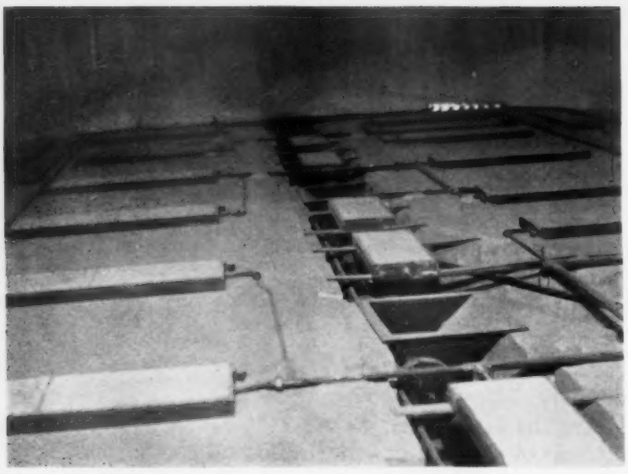
Grinding of modified Type B cement clinker in tubular mills is known to develop comparatively high temperatures which cause coating of the grinding balls and affect the stability of the gypsum in the cement. In view of this fact and the fact that the clinker was fed to the mill at comparatively high temperatures the following figures on the temperatures developed in grinding this material in the B&W mill are interesting. Records are presented below for 3 typical days. Clinker is taken direct from the cooler.



The device which automatically controls feed of mixed clinker and gypsum to mill.

Material	Temperatures		
Clinker fed to mill.....	185° F.	140° F.	120° F.
Material discharged from mill	240	248	238
Tailings from separator..	232	240	228
Finished cement from separator	208	215	209

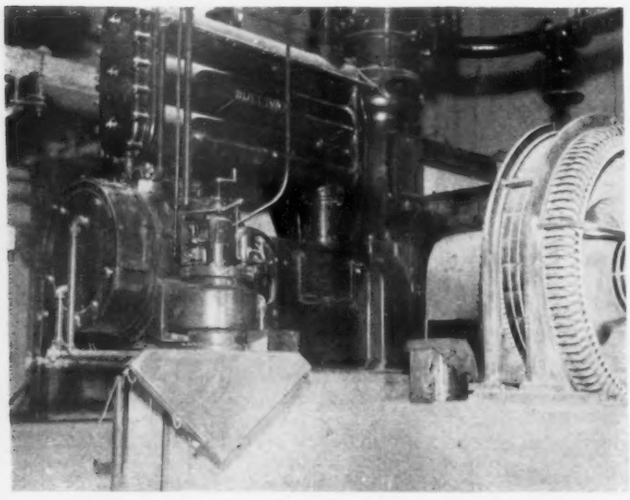
It is also interesting to note that after 75,538 bbl. of cement had been ground in this mill there was no perceptible wear on the bottom grinding ring which is made of "Elverite B" metal. There was about



Arrangement of vents and pipes for aerating cement in silos and discharge openings for cement.

¼ in. of wear on the grinding balls and driving ring, only a small fraction of the amount of wear which would require replacement or rebuilding of these parts. The mill is direct-driven by a 400-hp., 440-v. Wagner synchronous motor and operates at 80 r.p.m.

The Cera pump which receives the finished grinding mill product is a Size 18 single-tank unit. It can discharge either to the old stockhouse or to the new storage silos. The old stockhouse is in two sections with 15 bins having a total capacity of 80,000 bbl. The pump line discharges the cement into a tank, from which a Polysius rotary feeder discharges it on a 380-ft. belt-conveyor which distributes it to storage. Cement is reclaimed from



The 12-in. and 20-in. by 14-in. air compressor which supplies all air for plant.

storage by three screw conveyors which discharge to a Redler 9-in. by 45-ft. cross conveyor. A 9-in. by 86-ft. Redler conveyor feeds the cement to a Cera pump in the new pack-house. These conveyors have a capacity of 250 to 300 bbl. per hr.

The other branch of the pump line discharges the cement into the four new reinforced concrete silos. These are 32 ft. in diameter and 90 ft. high and with their six segmental compartments have a total capacity of 100,000 bbl. These silos are fitted with Polysius aërating systems to insure the fluidity of the cement. The aërated cement flows from the silos to the 2-tank Size 14 Cera pump in the new packing building. Cement is fed to two 50-ton packer-feed bins and to two 16-ton bins, from which bulk cement is loaded by gravity into cars. The two 3-tube Bates packers discharge the loaded bags on conveyors from which the cement is trucked into cars. A Sly dust-collector formerly used in the old pack-house has been moved to the new building.

The Polysius Cera pumping systems used in this plant are widely used in other countries but these are the first installations in a cement plant in the United States. Essentially one of these systems consists of 2 tanks, set either side by side or one above the other. The material flows by gravity first into one of the tanks and after reaching a certain level the flow is automatically shut off and diverted to the other tank. While the latter is being filled the material in the first tank is being discharged by the injection of compressed air. When this tank is empty the flow is automatically reversed to refill this tank while the other is being emptied. This sequence is automatically repeated as long as the system is in operation.

The unit under the B&W mill has a capacity of 19 tons per hr. of cement or 35 tons per hr. of raw material. The 2-tank Cera Size 18 pump system handling pulverized raw material handles 75 tons of material per hr. The Size 14 two-tank pump in the cement packing building handles 350 bbl. per hr.

The Polysius aërating systems installed in the new raw-material and cement storage silos consist of boxes in the bottom of the silos. These boxes are connected to air lines with valves to control the air volume. The air rises through the material and fluffs it, creating a mixing action similar to that produced in boiling water. Special inverted air-pressure bag filters on top of the silos release the air contained in them to the atmosphere without dust while the silo is being filled. The aërating system is said to function efficiently regardless of the length of time the material has been stored and mixes the entire content of the silo uniformly. The aërated material flows by gravity from the silos through pipes to the pumping systems.

Because of the fact that the aërated raw material and cement in the two new sets of silos flow by gravity to the pumps with a very low head it was possible to build these silos at a much lower level than is ordinarily the case. This meant a considerable saving in the cost of building the silos. The amount of air required in aërating these materials reduces the amount of air required for pumping by an equal amount.

Air for the three Cera pumps and the aërating systems used in this plant is furnished by a Sullivan Class WN4 air compressor with two cylinders, one 12 in. by 14 in. and the other 20 in. by 14 in. A 400-hp. Electric Machinery Mfg. Co. motor is direct-connected to one cylinder and to the other through a Cutler-Hammer magnetic clutch so that

(Continued on page 90)

Stabilized Surfacing of U. S. Highways to Open Up Large New Industry

Markets are in Easy Reach for Millions of Tons of Aggregates

By RAY A. GIDDINGS

Secretary, Calcium Chloride Association
Detroit, Mich.

"I'VE made requisition for 120,000 tons of stabilized surfacing for my roads." Thus speaks one highway engineer. But who's going to furnish it? Markets for millions of tons of prepared aggregates are within easy reach of the aggregates industry through this new phase of production.

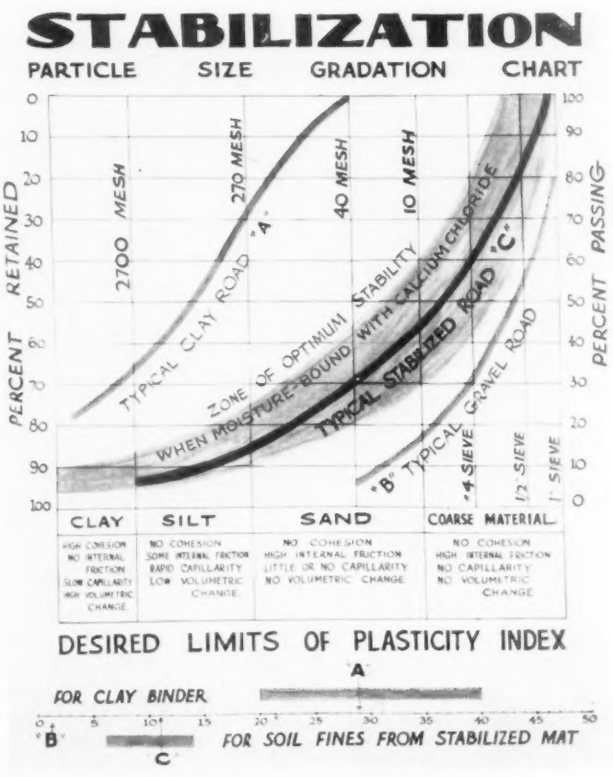
Three-fourths of our national highways are unimproved. A large part of them are farm-to-market routes, now a primary national issue and the necessary improvement of which will make up the bulk of our highway construction work for the next decade. They must be low-cost, yet all-weather, roads. And as necessity is the mother of invention, highway research and the development of soil science have produced the stabilized road.

Thus we have a new industry, where by combining and properly proportioning our aggregates and binder soils, we can now produce surfaces that are hard and smooth in rain or shine, summer or winter, and actually as dense as concrete. Now we can surface a road with stone or other suitable aggregate and so stabilize it that, with minimum construction and maintenance expense, we find unlimited extension of improvement to render all-weather service for ordinary traffic requirements possible and practical. Hundreds of miles of stabilized roadways have already been built by highway engineers throughout the country, and stabilization is rapidly becoming recognized as a basic type of construction.

Soil Stability.—We are aware that gravel and stone roads make excellent surfaces when they are well compacted, particularly when wet. We are also familiar with the phenomenon at Daytona, Fla., where for a period each day the beach sands attain surface stability which allows record-breaking speed tests. In this case the receding tide, in draining off the sea water, imprisons the sand grains in tiny moisture films, much like soap bubbles. Altogether these exert a tremendous bonding effect to produce this amazing riding surface, while after the moisture films have burst and the sand has dried, it is as loose and unstable as any beach sand.

It has proved impracticable to produce artificially such moisture-film-cohesion in the relatively large particles making up a gravel or stone road surface. But we find, if we introduce finer soil particles (clay), that we can produce the same type of moisture bond, and with the occasional addition of calcium chloride, a chemical which attracts and holds the necessary moisture, can indefinitely prolong its stability and durability as a riding surface.

New Outlet for Plant Production.—The producers of commercial aggregates are ideally situated to take advantage of the tremendous market for this type of low-cost surfacing, which is wholly in addition to, and in no way competitive with, existing aggregates markets for higher types of surfacing.



First, it is vital that the aggregate and filler materials be proportioned and properly graded as to size, so that the resulting mat will have the minimum of voids. This is clearly evident by reference to the accompanying particle-size gradation chart and the combination required is extremely rarely found in "run-of-pit" deposits.

It is also pertinent that just as effective stabilization and probably easier maintenance result in the use of combinations where as much as 100 per cent. of the material passes the ½-in. screen. This makes it practicable

to use sizes that are classified with waste in many aggregates plants. Pea gravel, often a drug on the market, is ideally suited to the large size and bulk of such mixtures.

We have pointed out that properly sized and proportioned aggregates are required. For convenience these are designated as coarse aggregate, fine aggregate (sand), silt and clay.

It is of course impossible to classify the silt and clay fractions by screening, so the quantity and quality of these elements are determined by tests of their cohesive properties.

Plant Mix Simplifies Procedure.—Plant production so simplifies construction procedure that the work may be undertaken where limitations, such as lack of laboratory facilities, equipment shortage, and traffic and weather conditions, would make mixed-in-place work impracticable and more costly.

In commercial production it is generally possible to locate a convenient and ample source of the so-called "binder-soil" (sometimes pit overburden is quite suitable), which, when once tested, can be stipulated for regular use when combined with the available aggregates in proportions as specified to attain a uniform and the most stable surfacing.

On the other hand, state, county and city engineers would have to set up a soils-testing laboratory with a trained operator, and then prospect and analyze the various available soils and subsequently design special mixtures for each job depending upon the source from which the material is to be hauled. It may be readily seen that many engineers simply will not undertake these functions if plant-mixed material is available at favorable cost.

As a further consideration, plant mixing not only yields a more thorough and uniform mix but also solves many operating problems for the engineer. It eliminates the need for continued road mixing or special equipment, and minimizes equipment operations on the road. This will reduce traffic interruption and may prove particularly advantageous in city street improvement which is further complicated by cross-walks. Road operations will require the use of water in spreading and compacting the mixed material, and involves either waiting indefinitely for rains or providing special equipment for hauling and sprinkling. Plant mixing, however, includes the necessary water in controlled amount, eliminating sprinkling, and making construction practically independent of weather conditions.

Thus, the construction of stabilized roads is greatly simplified by the use of plant-mixed aggregates, and is reflected in numerous economies. A screening and crushing unit need only to be augmented with a means of pulverizing clay and a mixer in order to turn out prepared material that is hauled directly to the job and spread on the road. Time and space limitations forbid a detailed discussion of the tremendous advantages with plant production, but they represent tangible arguments for effective sales efforts.

Enterprising Producers Entering Field.—It would be impractical to attempt to go further into the soil science involved and the details of plant adaptation at this time. Several reports have already been published[1] of gravel, stone and slag plants that are actively and profitably producing stabilized aggregates. It is predicted that eventually no engineer will attempt to surface roads of any importance with ordinary pit-run gravel. In addition to this market the commercial producers of mineral aggregates have an extensive market for stabilized material for pavement shoulders, bases and widening private, park and cemetery drives, for public parking lots, playgrounds, tennis courts and numerous other places where higher-type surfacing is too expensive.

When commercial plant operators get squarely behind the national campaign for low-cost improvement of secondary roads, stabilized surfacing will unquestionably afford an aggregates market many times greater than has ever before existed in the highway construction field. The Calcium Chloride Assn. and its member producers maintain a staff of trained engineers and soils experts whose services are available to the aggregates producers desiring to enter this field.

Spokane Cement *(from page 88)*

only one cylinder need be operated when the demand is low. The intake of each cylinder is equipped with an American air filter. This compressor has a capacity of 2,300 cu. ft. per min. at 70 lb. pressure, which is sufficient to supply all the compressed air needed to produce the guaranteed output of 2,000 bbl. of cement a day and leave a reserve of 500 cu. ft. per min. This will be sufficient to produce 2,400 bbl. per day from two Lepol-equipped kilns with less reserve.

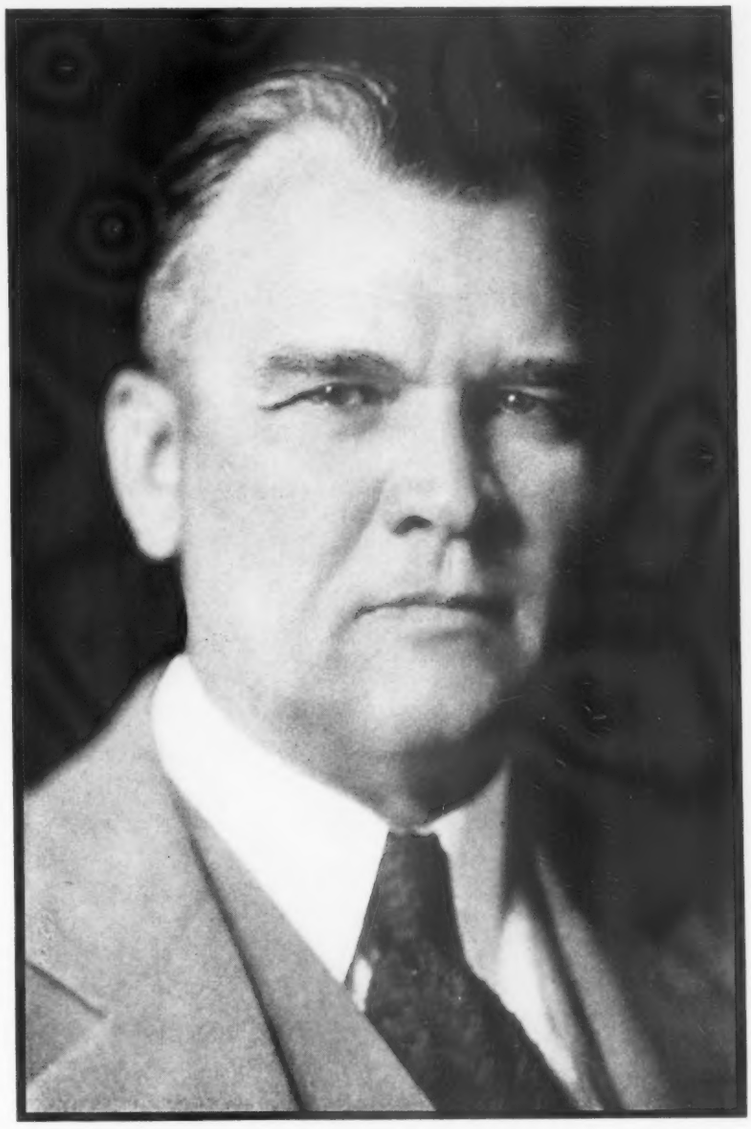
The compressor is installed between the grinding and burning departments in a central location. The electric substation was moved from its former location in a separate building into the same room, putting it nearer the large motors. Also located in this room are three motor-generator sets for the excitation of the synchronous motors and one set for the direct-current feeder-drive motors.

Most of the Polysius equipment was made by the Union Iron Works, Spokane, from plans furnished by the Polysius Corp. S. K. Kulp, service engineer for the Babcock & Wilcox Co., supervised the installation of the new grinding mill and operated it until the plant operation was attuned to the new equipment. Alloway & George, Spokane, built the reinforced-concrete silos and the new pack-house.

All the above-mentioned work was done under the general supervision of R. K. Neill, president and general manager and Frank D. Neill, superintendent of the Spokane Portland Cement Co. The other officers of the company are: E. C. Powell, vice-president; H. M. Heleniak, vice-president and sales manager; G. M. Bell, secretary-treasurer and purchasing agent. The main office of the company is at 724 Old National Bank Bldg., Spokane, Wash.

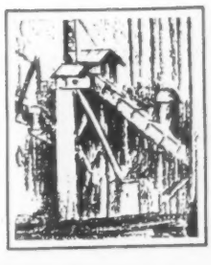
[1] *Michigan Producer Erects Small Plant to Produce "Stabilized" Gravel*, PIT AND QUARRY, October, 1935, pp. 36-37. *Premixed Stabilized Soil for Road Surfaces*, ENGINEERING NEWS-RECORD, September 19, 1935, pp. 389-391.

MEN OF THE INDUSTRY



J. H. COLTON

AS A vice-president of Pacific Portland Cement Co. of San Francisco, Cal., J. H. Colton has general charge of operations at the company's four plants which are engaged in the manufacture of Portland cement and gypsum products. He has been particularly active in his company's development of the gypsum end of the business. The cement plant at Redwood City, Cal., one of the first to utilize oyster shells as raw material, was built under Mr. Colton's direction.



Personal Mention

O. E. MacMullen, regional engineer of the Portland Cement Assn. at Philadelphia, was elected secretary of the Producers' Council Club of Philadelphia for 1936 at the annual meeting held in December.

John Osuch, blasting foreman at the Hudson, N. Y., plant of the Universal Atlas Cement Co., has been awarded a 25-year service medal and granted admission to the cement company's Silver Medal Club.

Erie L. Gale has been appointed district sales manager in the Des Moines, Ia., area of the Pennsylvania Dixie Cement Corp., according to an announcement by Walter S. Wing, general sales manager.

Charles Baumberger, Jr., vice-president of San Antonio Portland Cement Co., was elected to a three-year term as director of the San Antonio Chamber of Commerce at its December meeting.

Robert B. Henderson, president of the Pacific Portland Cement Co., San Francisco, Cal., has been named a vice-president for 1936 of the National Association of Manufacturers.

William Maki has sold his interest in the Vancouver Granite Works, Inc., Vancouver, Wash., to **Alexander Ursin.**

F. I. Marsh, Jr., formerly eastern representative of the National Gypsum Co., with headquarters at New York, has been made southwestern manager and has his office in the Burt Bldg., Dallas, Tex.

Hans H. Muehlke, G. J. Donaghy and **Parmeley Herrick** have been elected directors of the International Cement Corp., following the resignations of **Robert G. Stone, Charles Hayden** and **John R. Dillon.**

Garner A. Beckett, vice-president and general manager of the Riverside Cement Co., Riverside, Cal., was recently made a member of the board of directors.

R. O. Binkowski has resumed his executive position with the Harnischfeger Corp., Milwaukee, Wis., and will direct the activities of the newly-formed division for manufacturing prefabricated steel homes. **A. M. Locke** was appointed sales manager of the housing division and **Thor Hansen** is production manager.

W. W. Erdman was recently chosen to direct sales of dolomite and limestone products by the J. E. Baker Co., York, Pa.

Paul B. Reinhold of Reinhold & Co., Pittsburgh, Pa., has formed the Atlas Equipment Corp. for the sale of contractors' and industrial equipment. Its offices are in the Oliver Bldg., Pittsburgh. Associated with President Reinhold are J. L. Baird, vice-president, and L. B. Cummins, secretary, both formerly with C. H. Arnold Co., equipment dealer, and H. A. Ward, formerly head of the Ward Equipment Co., all of Pittsburgh.

P. B. Reinhold

The Atlas company represents the Thew Shovel Co., the Universal Crane Co., the Blaw-Knox Co., the Master Vibrator Co., the Buffalo-Springfield Roller Co. and Littleford Bros.

John S. Gregg, formerly with the Moise Steel Co., Milwaukee, Wis., has joined the sales staff of the Milwaukee office of Inland Steel Co.

Robert E. Friend, president of Nordberg Mfg. Co., Milwaukee, returned home in time to spend Christmas after a two-months' sojourn on the Continent. Mr. Friend spent considerable time in London, England, where his firm maintains a sales office.

S. N. Peters, sales manager of the Giant Portland Cement Co., was recently chosen a member of the board of directors.

Obituary

Col. Robert F. Massie, president and managing director of Asbestos Corp., Ltd., of Canada, died Dec. 5 in a Toronto hospital following an operation. Col. Massie had been connected with the asbestos industry since 1912. He was born in Guelph, Ont., in 1879.

Joseph S. Reiter, 49, auditor of the Colorado Portland Cement Co., died Dec. 10 at a Denver hospital following an operation. He had been ill for six months. He was a native of Ironton, O., and had been with the Colorado company for 26 years. He is survived by the widow, two daughters and four sons.

David Chambers, 49, steam-shovel worker employed in the Cold Spring, N. Y., quarry of the Hudson River Stone Corp., met his death while at work recently when a huge boulder rolled down the mountainside and crashed through the cab of his shovel.

William W. Miller, manager of the industrial department, General Electric Co., died in Schenectady, Dec. 22, following an operation for a ruptured appendix which he underwent two weeks previously. He was 55 years old.

Ira D. LeFevre, general auditor of the General Electric Co. since 1920, was elected comptroller at a meeting of the board of directors in New York, N. Y., Dec. 27. He succeeds S. L. Whitestone, who retired Dec. 31 after nearly a half century's service with the company.

Horatio S. Earle, 80, died at his home in Detroit, Mich., following a heart attack, Dec. 25. Mr. Earle was Michigan's first highway commissioner. He was at various times president of the Genesee Gravel Co., of Detroit; president of the North Wayne Tool Co. of Hallowell, Me.; president of the Good Roads Supply Co.; president of the Earle Equipment Co., and treasurer of the H. S. Earle Mfg. Co., a patent holding company to which the patents taken out by him were assigned. He is survived by two sons. Burial was in Grand Lawn Cemetery, Detroit.

Coming Events

January 15 to September 9, 1936. San Diego, Cal.—California Pacific International Exposition, re-opens January 15, 1936, and continues to September 9.

January 18-24, 1936. Cleveland, O. Annual Road Show, American Road Builders' Assn. at the Exhibition Hall.

January 27-30, 1936. St. Louis, Mo. Concurrent annual conventions of the National Crushed Stone Assn., the National Sand & Gravel Assn., the National Slag Assn. and the National Ready Mixed Concrete Assn. at Hotel Jefferson.

February 25-28, 1936, Wichita, Kans.—Ninth Annual Southwest Road Show and School, Exposition Bldg.

NEW CORPORATIONS

Ajax Gypsum Co., 231 S. LaSalle St., Chicago, Ill. Capital 50 shares par value common. Incorporators are Edna A. Hayes, Holly A. Wilcox and Irene Schoettle. To quarry gypsum.

Appalachian Exploration & Mining Co., Canton, Ga. Authorized capital stock $100,000 divided into shares of $100 each. Incorporators are Warren D. Keeler and James A. Keeler. To explore and mine gold, stone, gravels, phosphate, earth, oil and gas.

Atlas Sand & Gravel Co., Cranston, R. I. Capital $25,000 divided into fifty shares common. Incorporators are Americo Capparrelli, Maria G. Capparrelli and Emily Cook.

The Broward Quarries, Inc., Miami, Fla. Incorporators are J. G. Thompson and Waverly M. Hester.

Cumberland Mineral Co., Mount Sterling, Ky. Capital $25,000. Incorporators are W. B. Townsend, M. L. Tipton and D. H. Tipton.

The Dolomite Co., Sarasota, Fla. Organized by John L. Early, mining engineer, will install a mining and processing plant. S. D. Gooch is president of company.

Hagen Stone, Inc., Des Moines, Ia. Incorporators are Fred T. Hagen, president, and A. E. McMullen, secretary.

The Haines Canyon Rock Co., Haines Canyon, Tujunga, Cal. Engaged in business under the management of John M. Ferry.

Morrow Brothers, Inc., Seattle, Wash. Capital $25,000. Incorporators are Ned Roney, J. G. Morrow and Clyde B. Morrow.

The Texas Nel-Stone Co., San Antonio, Tex. Incorporators are J. G. Rentz and V. C. Trabucco.

M. O. Weaver, Inc., Des Moines, Ia. Capital stock $150,000, divided into 1,500 shares. Officers are M. O. Weaver, president-treasurer; John J. Stark, 1st vice-president; Paul Templeman, 2nd vice-president; and B. L. Moore, secretary. To quarry rock products, sand, and other materials used in concrete and other structures.

The Zenith Foundry Sand Supply Co., 257 South Spring St., Los Angeles, Cal. Incorporated by T. R. Harris and others.

Foreign Developments

Wang Method Used in Slag Hydration Study

A detailed study of the reactions between blast-furnace slag and water was made by means of the method developed by T. Wang for studies of cement, in which in place of finely ground cement fine particles of slag of 88 to 120 were caused to react by shaking with water or hydrous solutions and the new formations were separated from the original material by decantation.

It was found that, in agreement with experiences in practice, the action of pure water causes neither a swelling of the slag particles nor an appreciable formation of new compounds, while so-called exciter solutions release vigorous reactions. The "alkaline" excitation is based on the combination of calcium hydroxide, and the "sulphate" excitation on the combination of calcium sulphate with the slag. The excitation affects principally the aluminates of the slag. The alkaline excitation causes the formation of high-basic calcium aluminate hydrates, the sulphate excitation the formation of calcium aluminate sulphate hydrate. This finding agrees with the practical experience that slags with too low alumina content have only weak hydraulic properties.

The hydration of the silicates brings about the formation of calcium silicate hydrates with a molar lime-silica quotient of 1.0 to 1.5. Even in the presence of alkaline exciters the concentration of calcium hydroxide in the fluid phase is very low in comparison with Portland cement, in which saturated lime water always occurs; the reason for this is to be sought in the combination of lime by the slag and in the action of varying amounts of sulphide.

Calcium sulphide is favorable to the hydration process mainly in that in its hydrolysis there are formed calcium hydrosulphide and also calcium hydroxide, which is an exciter. Elemental sulphur, which was found in the slag, reacts with the calcium sulphide in solution, forming calcium polysulphide, and with the dissolved calcium hydroxide, forming thiosulphate; the polysulphide also converts to thiosulphate; these reactions consume lime and consequently restrict the progress of the hydration.

In the series of tests conducted, the reactions of the hydration process went on in a certain "rhythm"; first there was a lively reaction and a coat of gel formed around the slag particle, gradually slowing down the reaction until, on reaching a certain thickness, the coat was mechanically split off and the surface bared for further surface reaction.

If sufficient amounts of lime are available, the same hydrated silicates and aluminates of calcium are formed in the hydration of slag in the presence of an alkaline exciter as in the hydration of Portland cement.—Dr. Friedrich Kaempfe in *Zement* 24:257-262, 272-275, 317-321, 335-339, 381-385, 398-400; April 25, May 2, 23, 30, June 20 and 27, 1935.

Hydraulic Property of Slag Is Investigated

The analogy of the difference between slag rapidly cooled in water and that slowly cooled in air to the difference between ordinary clinker and the occasional clinker from a shaft kiln which crumbles on cooling supports the conclusion that slag cooled in air, which is feebly hydraulic, contains B dicalcium silicate, the only hydraulic silicate in slags.

Slag whether granulated or not has a certain hydraulicity, and the addition of a very small quantity of hydrated lime accelerates the hydraulic activity. This accelerating action of even a very small quantity of lime can scarcely be due to any combination with the silica gel. Furthermore, anhydrous or more or less hydrated calcium sulfate, as well as a mixture of hydrated lime and calcium sulphate, have the same activating effect as the hydrate of lime. Further studies on the hydraulicity of slag are in progress.—E. Leduc in *Revue des Materiaux de Construction et de Travaux Publics*, No. 310, July, 1935, pp. 161-165.

Slag Similar to Cement Is Made in Test Furnace

In connection with some experiments on the operation of a blast furnace by adding oxygen to the forced air, the Gutehoffnunghütte (Good Hope Furnace) in Germany built a special experimental furnace and, among other things, experimented with the production of a slag similar in composition to Portland cement—that is, with increased content of limestone. This was found to be an actual possibility when the air is enriched with oxygen to the extent of 25 to 30 per cent., and the air blast preheated to 750 to 800 deg. C. The high-calcium slag, ordinarily difficult to fuse, passed through the furnace smoothly and without destruction of the furnace lining. It was also discovered that in the case of this high-calcium slag a smooth operation without destruction of the lining depended on the condition that the proportion of slag to raw iron should not exceed 750 kg. per ton.

On the basis of tests made on the cement produced it was concluded in general that about the same principles obtain in the development of the necessary practical properties of cement so produced as in the case of sintered Portland cement. Some of the slags attained strengths equal to those of good German high-test standard cements. With a suitable chemical composition, a furnace operation freed from the difficulties of experimental operation and with the elimination of certain components harmful to cement strength, especially carbide, the strengths for smolten cement slags ought to be considerably increased. Of the problems still to be solved in connection with the production of a marketable high-test Portland cement in the blast furnace, two are preëminent: the complete elimination of calcium carbide in the full-size operation, and regulation of the setting time.—G. Mussgnug in *Zement*, 24:485-490, 503-507, August 8 and 15, 1935.

Hydrochloric Acid as Strength Accelerator

On the basis of tests on the use of calcium chloride and hydrochloric acid in construction work the author concludes that such admixtures increase the strength of concrete not only during the first few days but even after the first 28 days. This effect is especially strong in connection with puzzuolan-Portland cement. Also, the density, impermeability, chemical resistance and, under certain conditions, the constancy of volume of concrete mixes are improved. It was further observed that the electrical conductivity of the concrete is diminished, so that the necessary tension in the electrical heating of concrete can be lowered. The use of hydrochloric acid in place of calcium chloride is to be preferred in that the use of the material is not so great and the favorable action on the strength at times is greater. In the working of old cements the hydrochloric acid destroys the inactive granular surfaces, which is not true in the case of calcium chloride.—Prof. B. Skramtajew in *Der Bautenschutz*, 1935, No. 7, pp. 85-88; *Tonindustrie-Zeitung* 59:737, July 29, 1935.

Planks, slabs and panels, prefabricated from gypsum products, are now being subjected to tests in building units. Such products have been used extensively in American building construction during the last twenty-five years, but recently new types have been worked out, and their use in the structural core (walls, partitions, floors, roof and stairs) of modern dwellings is now under test in the construction of a complicated eight-room house.

Traffic News and Comment

Recent I.C.C. Decisions

Crushed Stone, Sand and Gravel—In a thirteenth section proceeding covering the rates on crushed stone, sand, gravel and related articles between points in South Carolina the Commission in 177 I.C.C. 123 and 197 I.C.C. 215 prescribed as minimum a basis for intrastate rates on crushed stone, sand, gravel and related articles between points in South Carolina the 17,517 basic single line and joint line scales that had been previously prescribed for interstate transportation between points in southern territory except Florida. Later in 205 I.C.C. 563 and later in 209 I.C.C. 307 the S.A.L. and the C., M. & C., were authorized to use lower rates to meet truck competition. Following this the South Carolina Commission prescribed for both single and joint line hauls the single line scale which the Federal Commission had prescribed for single line movement and it was on this action that the thirteenth section proceeding was instituted. Crushed stone producers complained that unless the rates were reduced they could not meet the competition of traffic moving to Charleston from eastern points by unregulated water lines. A large part of this material is used for construction work by the United States at the Charleston Navy Yard. In this report the Commission has authorized the A.C.L., the Southern and the S.A.L. to reduce the rates on crushed stone from Rion, Blair, Columbia and Cayce to Charleston, S. C., the reduction from Rion being from 149.8c to 115c a net ton; from Blair from 139.1c to 105c; from Columbia from 128.4c to 95c; and from Cayce from 128.4c to 95c per net ton. In a dissenting opinion Commissioner Lee said the Commission had no cause to prescribe intrastate rates in this case and should modify its original findings and vacate the order with respect to intrastate joint line movements. I.C.C. Docket No. 22,109, crushed stone, sand, gravel, etc., within the state of South Carolina.

A recent decision which is of interest to producers of non-metallic minerals generally in that it gives the formula of one carrier for estimating out-of-pocket costs and institutes a departure by the Commission in handling thirteenth section proceedings, is the supplemental report dealing with water competition on crushed stone, sand and gravel within the state of Louisiana. The Solvay Process Co. has established a plant at Baton Rouge for the manufacture of caustic soda, soda-ash and other chemicals which require a large volume of carbon dioxide. This gas is produced most economically by burning limestone or oyster shells. The shells can be brought in by water, or the limestone may be brought in by rail over the line of the Louisiana & Arkansas Railway Co. who are the petitioners in this case. The Solvay Company prefers the limestone to oyster shells and have stated that they are willing to pay from 20c to 25c a ton more for the rail transportation of limestone than they would have to pay for the water transportation of shells. This traffic would amount to 700 tons of limestone a day. The Commission has exempted the movement of kiln limestone from Carla, La., to North Baton Rouge, La., from the findings and order in 155 I.C.C. 247. This action is unprecedented as the Commission relinquishes entirely its jurisdiction over this rate. On this point Commissioner Porter in a concurring opinion sad: "I think attention should be called to the fact that the finding made in this case is a wide departure from what has heretofore been our practice when carriers have requested that we modify a Section 13 finding, in order that they may put in intrastate a lower rate than that which we have ordered maintained so that preference or prejudice might be removed as against an interstate rate. Since the adoption of the transportation act of 1920, the carriers desiring modification of an intrastate rate theretofore fixed by us in a Section 13 proceeding, petitioned that we modify the rate so as to authorize them to put in its place a specific rate named in their petition. We have uniformly acted in accordance with their petition. It will be observed that when we have done so, we have maintained our jurisdiction over the intrastate rate asserted in the Section 13 proceeding. But in the finding made in this case, it will be noted we have departed from that unbroken custom and find that our order should be modified so as to exempt from its provisions entirely our control over the intrastate rate. I do not want my concurrence in this action to be taken as concurring in the legal proposition that we lose our jurisdiction to control the intrastate rate because of a modification in the order as originally made by us. I concur in the result in this case as a matter of policy only, feeling that inasmuch as the carriers are here asking the right to establish an intrastate rate lower than that originally found prejudicial by us, in such instances and under all of the circumstances, as a matter of policy only, we should entirely relinquish our jurisdiction over the rate and put it back within the control of the state authorities. I am authorized to state that Commissioner Mahaffie concurs herein." The petitioning carrier in an attempt to justify the proposed rates of 67.5c a ton on a minimum car of 50 tons used the following reasoning: "Based on 50 tons, the present rate of $1.38 yields earnings of $69 per car, 44.8c per car-mile, and 8.9 mills per ton-mile. On the same basis, the rate of 67.5c would yield $33.75 per car, 21.9c per car-mile, and 4.38 mills per ton-mile. However, the cars to be used for the prospective traffic are open-top equipment capable of carrying 62.5 tons of crushed limestone; and carrying, as an average load, 55 tons. On basis of 55 tons, the 67.5c rate would yield earnings of $37.12 per car and 24c per car-mile. All switching and assembling will be done at the quarry without expense to petitioner, and the Solvay Process Co. will maintain a reserve pile at destination where the loads may easily be discharged without delay.

As indicating that these earnings, on the basis of 55 tons per car, will yield something over and above out-of-pocket costs, petitioner presents two methods of estimating such minimum costs. Under the first method it is assumed that the total cost of moving traffic may be divided in half, one half representing the out-of-pocket expense of handling and the other half covering the salaries of general officers, taxes, fixed charges, and maintenance of way and structures, to all of which petitioner would be subject whether or not the particular commodity moved. On this basis, petitioner asserts that during 1934 the cost to it of handling all freight traffic was 7.07 mills per ton-mile; and, dividing this in half, the out-of-pocket cost of such handling might be roughly estimated as 3.5 mills. On this basis, the out-of-pocket cost of handling 55 tons per car for 154 miles would be approximately, 54.44c per ton, $29.94 per car, and 19.44c per car-mile. This rough approximation would indicate that the suggested rate of 67.5c might have a margin toward general credits of about 13c a ton, or $7.15 per car. Under the second method, which estimates in detail the various items of cost for handling this added traffic, the conclusion is reached that the total cost per car would be $26.65. This cost, if accepted, as approximately correct, would indicate that the suggested rate, as applied to an average carload of 55 tons, would produce a margin of about $10 over and above the out-of-pocket costs of handling. I.C.C. Docket No. 17,000, part 11, crushed stone, sand and gravel between points in the South.

Sand—The Commission has found the rates on core sand from Davisville, East Greenwich, and Hill's Grove, R. I. and on a carload of molding sand from Elnora, N. Y. to New Brunswick, N. Y. shipped between May 9, 1933, and July 10, 1934, unreasonable to the extent they exceeded $1.80 a net ton from Elnora, $2.95 from Davisville and East Greenwich and $3.15 from Hill's Grove, the minimum carload weight being 90% of the marked capacity of the car. I.C.C. Docket No. 26,779 International Motor Company vs. D. & H. et al.

On further hearing the Commission has awarded reparation of $22,001.91 after modifying in part the findings in a prior report in 188 I.C.C. 99. The Commission finds the rate on sand from Muskegon, Mich., to Westfield, Mass., charged on shipments unreasonable to the extent it exceeded the bases prescribed in the prior report subject to the scale III rate of $5.00 for 1,396 miles, and subject to an arbitrary of 70c on shipments moving through New York Harbor. I.C.C. Docket No. 22,476 H. B. Smith Company vs. N. Y., N. H. & H. et al.

The Commission has found not justified, proposed rates on phosphatic sand from Brewster, Fla., and intermediate points of origin to destinations in Georgia, Alabama, the Carolinas and Virginia. The proposed rates were to apply only on sand in open-top cars from Brewster to fertilizer manufacturing points with no change proposed in the rates in phosphatic clay which is a competing product. It was contended at the hearing that this would result in a discrimination between shippers in open-top cars and shippers in box cars and between the fertilizer manufacturers and consumers at other destinations. I. & S. Docket No. 4,118, phosphatic sand from Florida and southern points.

Examiners' Reports

Ground Limestone—Examiner C. W. Griffin proposes that the Commission award reparation on finding that the rate of $2.60 a net ton charged on ground limestone from Thomasville, Pa., to Millville, N. J., was unreasonable to the extent it exceeded $2.05 on a minimum of 60,000 pounds plus the authorized emergency charges. I.C.C. Docket No. 27,042 Whitall Tatum Co. vs. W. M. et al.

In another case Examiner Griffin proposes reparation and a finding that the rates on ground or pulverized limestone from Engle, W. Va., and from York and Annville, Pa., to Carney's Point, N. J., and from York to Gibbstown, N. J., and Hillside Junction, Pa., unreasonable to the extent that they exceeded $1.75, $1.80 and $2.10 from Annville, York and Engle, respectively, to Carney's Point, and $1.85 and $2.05 from York to Gibbstown and Hillside Junction, respectively, on a minimum of 60,000 pounds plus the authorized emergency charges. I.C.C. Docket No. 26,968 E. I. du Pont de Nemours & Co. vs. B. & O. et al.

Examiner A. S. Worthington proposes that the Commission award reparation on finding that the rate on ground or pulverized limestone from Thomasville, Pa., to Bridgetown, N. J., was unreasonable to the extent it exceeded $2.05 a net ton on a minimum of 60,000 lb. I.C.C. Docket No. 26,690 Owens-Illinois Glass Co. vs. C. of N. J. et al.

Sand—After further hearing Examiner R. G. Taylor proposes that the Commission award reparation amounting to $954.40 to be found due complainants on sand from Hawarden, Ia., to Canton, S. D., under findings in 201 I.C.C. 636. I.C.C. Docket No. 25,675, Booth and Olson, Inc. vs. C. M. St. P. & P.

Clamshell dredging bucket handles heavy rock.

Bucket Combines Greater Strength With Less Weight

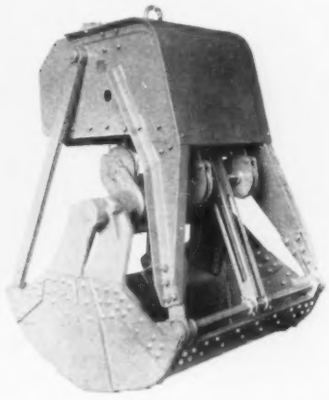
An entirely new type of Williams clamshell dredging bucket of 3¼ cu. yd. capacity, was one of the products of the Wellman Engineering Co. during the year. It weighs over 20,000 lbs., and is constructed of welded alloy steel normalized for grain structure. It has heat-treated shafting, alloy steel rivets and manganese steel teeth. The bucket is designed to handle heavy rocks, and the upkeep expense is said to be low.

Compact Walking Dragline Has Low Bearing Pressure

The Bucyrus-Monighan 5-W walking dragline, which is said to be unusually compact and to have an extremely low bearing pressure, is another of the Bucyrus-Erie products. Ease of shipment was an important consideration in the design of the machine. The center section of the revolving frame with all principal machinery in place, is shipped in one unit on one car. The swing mechanism and fuel oil tanks are below the deck and the machine is so balanced that little counterweight is required.

Motor-Driven Grab Bucket Has Numerous Advantages

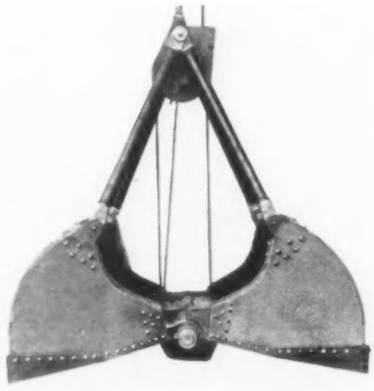
Motor-driven grab buckets ranging from ½ to 3 cu. yd. capacity for handling limestone, slag, sand and similar bulk materials were developed during 1935 by the Erie Steel Construction Co., Erie, Pa. The use of only two conductors between the control cab and the bucket is made possible through d.c. Westinghouse control. As each bucket carries its own motor, they can be attached to cranes, monorail hoists, or other hoisting equipment. Power is supplied either through a loop cable or a cable paid out from a lightweight drum —frequently spring-operated. The coupling between motor and worm gears serves as a braking wheel. Powerful forces are exerted through sheaves operated through the gear—which makes for fast and efficient digging.



Grab bucket with self-contained motor.

Rehandling Grab Bucket Has High Capacity-Weight Ratio

A light rehandling grab bucket, known as Type RH, which is said to be exceptional in its relation of capacity to weight, was the year's product of the Mead-Morrison Division of the Robins Conveying Belt Co. The special shells are of an intermediate shape between flat and round, giving the advantage of the flat shell for digging and the round shell for quick discharge. Its low height and extra width result in a low center of gravity.



Rehandling grab bucket is light-weight.

Aluminum Alloy Is Used In Light-weight Shovel Dipper

Composite-type power shovel-dippers of unusually light weight which employ aluminum alloy and high-tensile rolled steel for parts not subjected to the heaviest abrasion, were brought on the market during the year by the American Manganese Steel Co. of Chicago Heights, Ill. Top castings of manganese steel of complete double wall construction, with integral bases and bail connections, are provided in this type.

15-cu.yd. dipper of aluminum alloy.

The front plates are high-tensile rolled steel welded with spacers to form a double wall between top and bottom castings. The back plate is of rolled aluminum alloy while the back braces connecting top and bottom castings are cast aluminum alloy. The door is a one-piece manganese steel casting with integral hinges. A 15-cu. yd. Amsco composite dipper was recently shipped to a large coal company for use in stripping coal. It replaced a 12-cu. yd. solid dipper and the added capacity is completely offset by the lighter proportional weight of the new bucket. The bottom castings are also double-walled at the back where the dipper stick is connected. A 15-cu. yd. Amsco composite dipper weighs 32,940 lb.

Bantam Weight Rail Crane Is Announced

Designed for spur handling of materials and car switching a new P&H Bantam Weight Crane, self-propelling on standard rail wheels, was announced by the Harnischfeger Corp. of Milwaukee. The all-welded construction is said to obtain greater structural strength with a minimum of weight, while the 25-ft. boom of welded tubular construction provides a wide working radius and lifting capacities with 75 per cent. stability ranging from 7730 lbs. at 10-ft. radius to 2630 lbs. at 25-ft. This, together with the quickly attached clamshell bucket or magnet, makes it a practical unit for a wide variety of uses. Mounted, the crane has a wheel base of 5-ft. 6-in., and overall length of 8-ft. 5½-in. The height of the entire machine is 10-ft. 6-in. and total weight is 21,000 lb.

Walking dragline of compact design.

Light-weight railway crane.

Excavating and Loading

A 2½-cu. yd. convertible shovel.

2½-cu. yd. Shovel Has Three Motors

A 2½ cu. yd. electrical shovel with 3-motor drive Ward-Leonard control, called Type 4101, is the product of the Marion Steam Shovel Co., Marion, O. It is the smallest in the company's intermediate group of close-coupled quarry type shovels and has the same features of construction as the larger size. The shovel can be equipped with any of three combinations of front-end equipment—a 31-ft. boom and 2½-cu. yd. dipper; a 34-ft. boom and 2¼-cu. yd. dipper; or a 36-ft. boom and 2-cu. yd. dipper. It is convertible into crane or dragline and a 4-unit motor-generator set is standard equipment.

Tractor Chassis Is Small Shovel Mount

A new idea in the small shovel, crane or dragline is the Speeder tractor shovel mounted on a Caterpillar Diesel 40 tractor by the Speeder Machinery Corp., Cedar Rapids, Ia. Advantages claimed for the unit are that it travels the same speed and will negotiate rough ground as easily as a tractor. The features include the Speeder patented crowd for shovel operation, anti-friction bearings, simple and extra heavy construction and one-man operation. Shovel boom length 14-ft. and dipper stick 11-ft. Crane and dragline booms are 22-ft.

½-cu. yd. Shovel for Gas, Electric, Oil

The "American Gopher" Model 350, ½ cu. yd. crawler-type shovel-crane-dragline is a 1935 development of the American Hoist & Derrick Co., St. Paul. It is made for gasoline, Diesel or electric operation and its features are splined shafts, anti-friction bearings, independent chain crowd, etc. The machinery deck is one-piece steel casting, and the cab is steel-enclosed with glazed door and windows. The hoisting drum clutches operate by "finger-tip" control and the twin drums are of skeleton type with removable cast steel grooved lagging. The boom hoist has two speeds, a steel worm and bronze worm wheel, and automatic brake for safety. The roller path is machined high-carbon steel with internal gear stub teeth, and the travel shaft operates through center pin taking travel loads only. The gasoline motor optional in the machine develops 52 h.p. at 1,000 r.p.m.

New ½-cu.yd. full-revolving excavator.

Welded Parts Feature Shovel-Dragline Outfit

A modern digging unit called the 85-B, is among the year's offerings to meet requirements of quarry and heavy duty by the Bucyrus-Erie Co., South Milwaukee. It combines the use of special heat-treated alloy steels, electric-welded construction and Ward-Leonard control, and is quickly convertible from shovel operation to drag-line, with a few simple adjustments of main machinery and front-end equipment. The base of 85-B is supported on two heavy cast side girders which form the frame for crusher rollers and tumblers. It carries a welded box-girder boom with outside dipper handles. The special rock dipper is made of two strong steel castings riveted and keyed together. The front is manganese steel. The shape allows rock to enter easily, and dipper opening is always unobstructed because the bail is attached at back without use of padlock. The 85-B working as a shovel weighs approximately 224,000 lb. As a dragline it will handle a 3-cu. yd. heavy duty bucket on a 65-ft. boom.

Convertible shovel-dragline machine.

New tractor-mounted shovel.

Bucket Loader Has New Features

The Model 82 bucket loader, manufactured by the Barber-Greene Co., Aurora, Ill., is declared to embody many exclusive features. These include a tank-type chassis frame which ties the main frame into a compact unit of great strength and accessibility and completely houses the driving machinery. A special arrangement of the spiral feeding screws provides synchronized feeding. A parallelogram axle with 2-point suspension gives knee action and always keeps the crawlers parallel. The design includes a patented floating boom principle, while the patented overload-release sprocket protects the machine from overloads. Other features are a quick-acting, self-locking swivel spout, and slow crowding and fast traveling speeds.

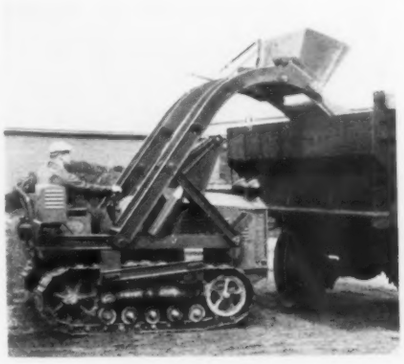
Another new bucket loader.

Excavating and Loading

New Machinery and Supplies

Tractor-Mounted Loader Is Hydraulically Operated

A new utility front end loader for use with Cletrac tractors was among the products of the Cleveland Tractor Co. in 1935. It was designed for loading freight cars, handling bulk material, levelling dumps, hauling, excavating, etc. Its features include hydraulic operation with two lifting



Tractor-mounted loader has wide range.

cylinders, eliminating clutches and cables; no counterweights; no projections above or below the tractor to interfere with normal clearances. The bucket may be dropped from any height by merely dropping the bottom. Changes from one unit to another can be speedily made.

These Excavators Embody New Operating Features

A new speed shovel dragline and crane, known as the Manitowoc, was among the products of the Manitowoc Engineering Works, Manitowoc, Wis., last year. Made in 1 to 2 cu. yd. capacities it embodies many improved features in design and operation. Some of these include: all gears and other parts are spline-fitted to shafts, there being one press fit throughout the entire machine; all gears and working parts are fully enclosed and operate in filtered oil circulated under pressure. The simplicity of the design is illustrated by the fact that there are only 13 gears (including the large ring gear), and one worm gear in the entire machine when silent chain power takeoff is used, and this number is increased by two when helical gear drive is desired. All motor controls are extended to the operator's station al-

Shovel embodies new design.

lowing for quick and complete control of the plant without the operator leaving his station. A major improvement is the new style disc swing and reversing clutches. When it becomes necessary to renew the disc frictions this may be accomplished without removing or dismantling the drive shaft assembly in any way. The tubular type shovel and crane booms provide greater strength with less front end weight. The dipper sticks are mounted on the underside of the shipper shaft sprockets, taking advantage of the normal upper pressure when operating under load, thus providing full and proper meshing of the sprocket teeth with the racks.

All-Welded Construction Used in Small Excavator

During the year a new Model 100 "Bantam Weight" full revolving ⅜ cu. yd. excavator was announced by the Harnischfeger Corp. Weighing approximately 15,800 lbs., this machine is fully convertible to dragline, crane, hoe, skimmer or pile driver service. It has travel speed from 1½ to 3 m.p.h. and a swing speed of 5 r.p.m. with P&H "split-second" clutches for easy control and fast starting and stopping. The live-boom chain crowd mechanism permits booming up and down without changing the length of chain, and the short tail swing permits working in close quarters. All-welding construction is credited with having reduced weight and increased structural strength. The power plant is a Ford V-8 truck motor which delivers 10 h.p. at 1300 r.p.m. Standard tractor links are used so that replacement can be readily made.

New full-revolving convertible excavator.

Portable Bucket Loader Has New Features

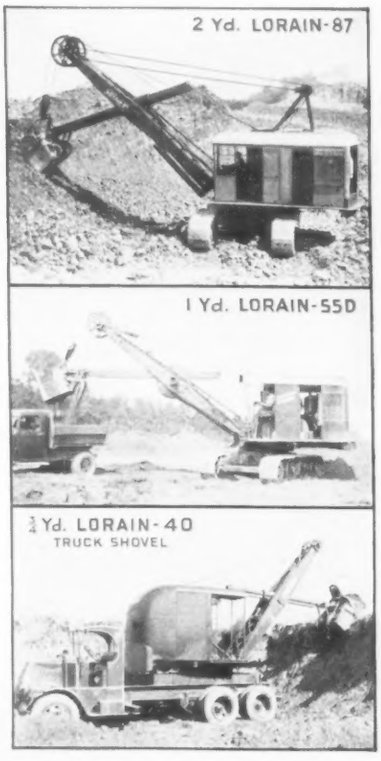
A portable bucket loader with wheel or crawler mountings can be obtained for work requiring a capacity of from 90 to 120 tons per hr., from the Portable Machinery Co. division of A. B. Farquhar Co., Ltd., York, Pa. It has a manganese-tipped spiral feed, swiveling spout, and many other features. The company manufactures a complete line of Porta conveyors for handling loose materials. This line includes flat and trough belt conveyors, drag conveyors, sectional conveyors of the shuttle type or with tripper, self-feeding bucket loaders, and portable loading and unloading conveyors, all in a variety of models, sizes and mountings.

Wheel-mounted bucket loader.

Three New Excavators Shown at Cleveland

The 1936 Cleveland road show will signal the formal announcement by The Thew Shovel Co., Lorain, O., of three new models. These are the 2 cu.yd. Lorain-87; the 1 cu.yd. Lorain-55D; and the ¾ cu.yd. Lorain-40 truck shovel.

The Lorain-87, built throughout to Thew center drive design, is equipped with a 24 ft. shovel boom, said to be the first really major advancement in shovel boom design since the invention of the shipper-shaft boom. It is virtually 2 booms in one—one, a structural member which absorbs all bending and compression forces — the other, a tubular, torsional member that absorbs and resists all boom twisting and



Three new excavator models.

torsional stresses. Each is independently connected to shipper shaft and to boom hinges so that each is called up to absorb only those stresses for which it is designed.

The 18-ft. dipper stick on the L-87 is made of seamless tubing, a section providing the greatest bending and torsional resistance per lineal foot of weight. It has an alloy steel crowding rack electric welded its full length, which acts as a huge key to keep the stick from twisting.

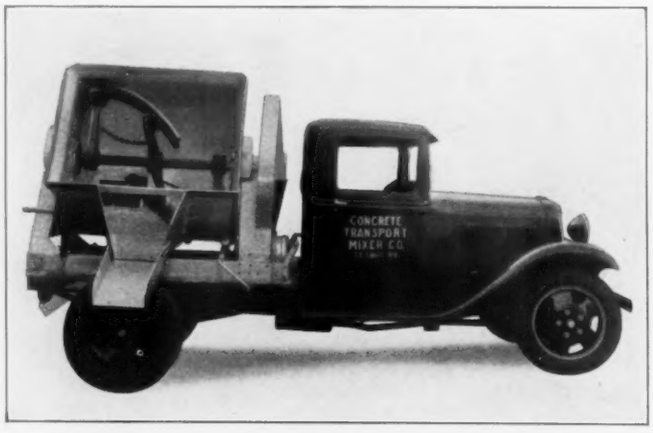
The L-40 truck shovel unit will be mounted on an Indiana truck, three-axle type, with 10 pneumatic tires. The ¾ cu. yd. capacity in a truck shovel is a new idea and brings to the field of highly mobile equipment a unit which in strength and capacity is capable of doing a real "man-sized" job.

The new L-55D is now built with a longer turntable, with a 19 ft. shovel boom, and is mounted on a heavier crawler, 12 ft. 3 in. long. It is powered by a 4-cyl. Diesel engine. Its crane capacity is 15 tons at 12 ft. radius.

Excavating and Transport

Truck Mixer Discharges To Either Side or Rear

The Concrete Transport Mixer Co., 650 Rosedale Av., St. Louis, Mo., is manufacturing the Master Mixer, a mixing-in-transit machine. The device comprises an open-top metal hopper within which is rotated, by the power of the truck's engine, a horizontal shaft carrying helical blades that mix the contents. The blades can be rotated at different speeds, ranging from 1 to 20 r.p.m. Discharge can be made either to the side or to the rear, and asphalt and road oils can be handled, as well as concrete mixes. The power take-off is made by the company and makes the mixing unit applicable to any type of truck. Truck mixers are available in capacities of 1 and 1½ cu. yd., truck agitators in capacities of from 1 to 3½ cu. yd. and plant mixers (stationary) in capacities of from 1 to 3 cu. yd.



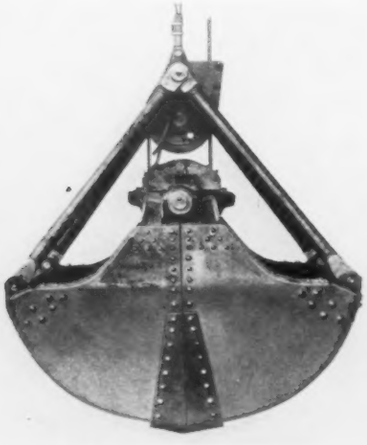
Truck-mounted concrete mixer designed to discharge to either side or to rear.

Light Weight Bucket Is Rugged and Strong

A light rehandling bucket was a 1936 development by the Mead-Morrison division of Robins Conveying Belt Co. The bucket is low, wide and rugged. The shape of the shells is intermediate between the "flat" and "round," giving flat-shell filling or digging and round-shell quick discharge.

The relatively low height and greater width combined with a low center of gravity make less headroom necessary and give greater stability on a pile. The straight rope reeving, without reverse bends and with a powerful purchase, gives fast opening and closing and great digging power. All bearings are of generous size with high-pressure direct lubrication.

The lower link hinges are of cast steel riveted to the steel shell plates and having large-area bumpers cast integral. The links, of large diameter steel tube construction, with cast steel ends welded in, present a smooth, round surface for possible contact with boats, cars, trucks or structures.



Light rehauling grab bucket.

Le Tourneau Announces New Cradle Dump Buggy

The Cradle Dump Buggy, a new earth-moving carrier of 30 cu.yd. capacity, built for use with large-size tractors, and without the front axle, for use with trucks as a semi-trailer, has just been announced by R. G. Le Tourneau, Inc., of Peoria, Ill., and Stockton, Calif. The HUG Model 100 tractor truck has been developed to handle this new development. The buggy's inside body dimensions are 9 by 13 ft., ample enough to make careful spotting of shovel buckets unnecessary when loading it. Unloading is controlled from the tractor driver's seat by means of half-inch steel cables and sheaves connected to a standard two-drum power control unit mounted at the rear of the tractor motor. The body is pivoted at the top and expels its load by moving in a cradle-like arc to the side, forcing the entire load off the buggy as it moves. One line from the Power Control Unit controls this dumping process, the other line returns the body to the loading position and holds it there.

Like all Le Tourneau equipment, the new dump buggy is stoutly constructed of special alloy steel, electrically arc welded. The body itself consists of four sides well-reinforced to prevent binding or twisting. The bottom is separate from the top and stationary. It serves the dual purpose of a base for the sides and a frame for the running gear and is ruggedly built to withstand the terrific shocks of loading earth and rock from shovels. It has a double bottom consisting of two layers of alloy steel with a 6-in. layer of wood in between. The two steel layers are tied together at 27-in. intervals by cross ribs of steel. A heavy, reinforced truss runs the full length of the bottom.

Construction work on a second large plant at Peoria, Ill., for R. G. Le Tourneau, Inc., is now in progress. This new addition, which will adjoin the original building, is to be constructed of brick and steel

Cradle-dump buggy showing the doughnut-like pneumatic tires.

Helical-Cut Gears On Two Excavator Models

A new truck shovel and crane was introduced to the trade by Bay City Shovels, Inc., at the Michigan Road Show held in October, 1935, at Lansing, Mich. This machine, known as Model 10, is convertible for operation as a shovel, crane, drag-line, or trench-hoe and is equipped with a fully-enclosed cab. It is a standard Bay City machine, incorporating helical-cut gears, frictionless bearings, chain crowd, unit-cast machinery table and swing circle. It can be supplied with Ford, Hercules, International or Chrysler industrial engines. It is designed for truck service only and is not convertible to crawler mounting.

The first public showing of the newest Bay City machine—Model 20—will be at the road show at Cleveland this month. This model is a full revolving ⅜ cu.yd. convertible crawler shovel with a working weight of ten tons.

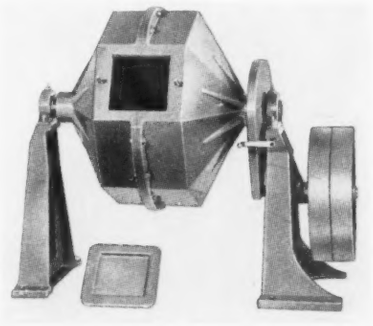
Announce New Shovel at Cleveland Road Show

At the 1936 Road Show, the Harnischfeger Corp., Milwaukee, Wis., will exhibit an entirely new excavator, the Model 765, which embodies the most advanced engineering ideas to speed up the digging cycle and increase production in a machine of 2 cu.yd. capacity.

The 765 is one of the new series of P&H 700 machines, a line which has been completely redesigned to take advantage of the recent developments in alloy steels and arc-welded construction for greater strength with less weight. In designing these machines, Harnischfeger engineers have taken advantage of several P&H features which suit them especially well for the adoption of Diesel power. The heavier construction of the P&H swing and crowd mechanisms have the additional strength and weight to carry the greater sustained power which the Diesel engine provides. It not only permits faster continuous digging speeds but also ample power carry-over to prevent motor stalling when the going is hardest. Although the 765 is also available for gasoline, this power model is powered by a 6 cyl. Caterpillar Diesel engine rated at 130 h.p. at 900 r.p.m. for burning the cheaper grades of fuel oil.

Tumbling Barrel Designed for Wet or Dry Grinding

During the year the Hartford Steel Ball Co. of Hartford, Conn., began marketing a triple-action cutting barrel suitable for

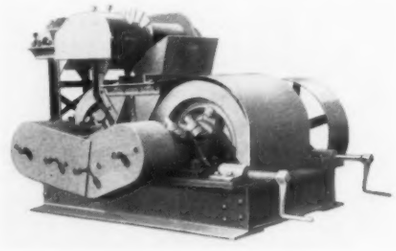


Triple-action barrel for wet or dry grinding or mixing.

wet or dry grinding, pulverizing or mixing. Rotation of the barrel is said to impart a tumbling action to the material within it. It has roller bearings, roller chain drive and a special belt shifter.

Make Geared-Link Roll Crusher in Two Sizes

A line of Greenville roll crushers designed to crush graded aggregates, including the smaller sizes of pebbles and

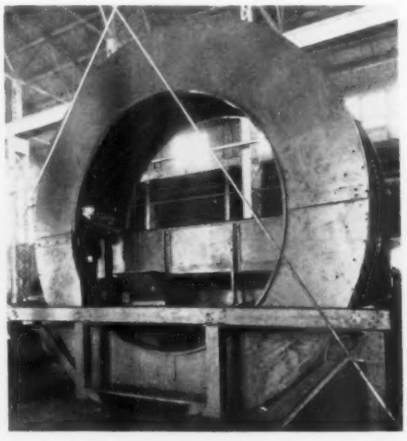


Geared-link double roll-crusher.

crushed stone is among the year's products of the F. M. Welch Engineering Service, Inc., of Greenville, O. The rolls consist of special heat-treated steel face shells mounted on adjustable cast steel cones.

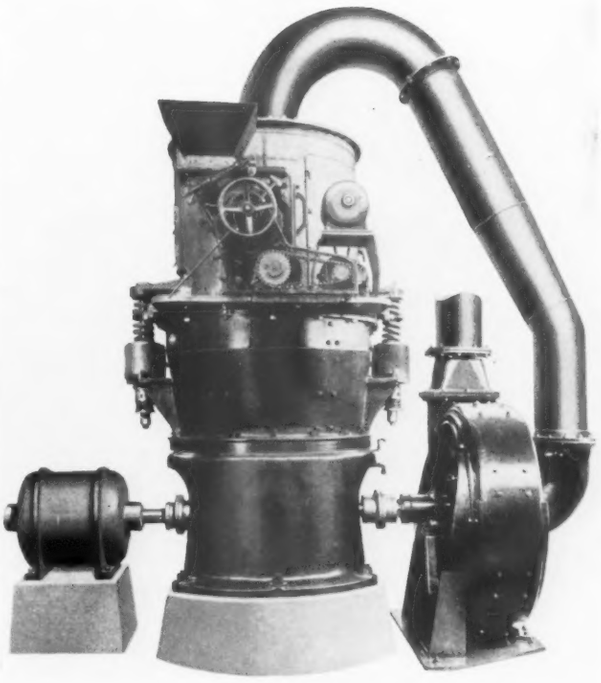
Basic Design Is Retained in Improved Hadsel Mill

A much improved Hadsel Mill, in which the basic design was retained, was announced during the year by the Hardinge Co., Inc., York, Pa. The original mill



Improved classifying and grinding mill.

lifted the raw material in buckets inside the drum and dropped it on sloping breaker plates at a sufficient height to give a violent crushing and grinding action. There the similarity ends, however, as the company has altered the construction and operation of the mill to eliminate defects in the original design. In the new mill the drum is suspended in a cradle on roller bearings. The frictional resistance is said to be so low that an empty mill can be turned freely by one man. The walls are extended in the drum above the buckets so that it operates as a self-contained unit. The ore is dropped on the breaker plates where both fines and coarse drop back into the buckets. Products ranging in size from 20-mesh up to 200-mesh are obtained through the ordinary means of control of classified speed, density, etc.



New bowl mill has revolving grinding chamber with clearance adjustable while running.

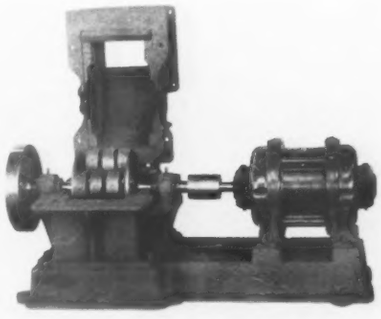
Revolving Grinding Chambers Feature of 1935 Bowl Mill

One of the departures from the conventional types of pulverizers was announced in the Raymond Bowl Mill, by the Raymond Bros. Impact Pulverizer Co. of Chicago. Development for a considerable period under extensive service tests, it is said, produced a machine designed for low friction losses, hence low maintenance, because of no metal-to-metal contact between the bowl and the rolls. High availability is obtained because adjustments can be made from the outside while the mill is running. The speed is constant with the output controlled by a varying rate of feed. Mill power is almost directly proportional to the load, and the machine is adapted both to direct firing and to storage systems in coal grinding operations. The unique feature is the revolving bowl or grinding chamber. Due to centrifugal force the material which is ground between the reduction rolls and grinding works its way up the inclined walls of the bowl. As the ground particles reach the rim, the fines and intermediate sizes are picked up by the air current coming up from the annular spaces around the bowl and are carried into the separator above without further classification. The bowl revolves on a vertical shaft, mounted on roller bearings, and is driven through a worm gear by a horizontal main shaft, direct connected to a constant speed standard motor. The vertical shaft and bearings are outside the grinding compartment, and are lubricated by a continuous circulation of oil. The mill parts are protected from damage resulting from tramp iron or other ungrindable material by a positive means of disposal. The pressure springs allow pieces of iron to pass the rolls without injury, and when the tramp iron reaches the top of the bowl, it is thrown into the annular space below and expelled by revolving plows through a discharge. For coal grinding and firing, the Bowl Mill is equipped with an air separator and automatic feeder, both mounted on the top plate. The exhaust fan is driven from an extension of the horizontal main shaft, so that one motor drives the fan and the mill. Hot air may be passed into the grinding chamber, when necessary for drying the coal.

An outstanding advantage of the Bowl Mill is its ability to give uninterrupted operation over long periods without shutdowns. Every detail and function of the mill are designed for endurance: an unfailing lubrication system, in which all moving parts can be oiled from the outside while the mill is running; oversize shafts mounted on high class bearings; exterior provision for adjustment of face alignment of rolls to compensate for wear; simplicity of design with few wearing parts, and these of extra rugged construction.

Laboratory Crushers with Features of Larger Units

A series of laboratory crushers and pulverizers which can be used for grinding a large variety of materials, was developed by the American Pulverizer Co., St. Louis. These small crushers are said to have all the features of the larger units manufactured by the company. All parts of the housing are machined to insure interchangeability, and are reinforced with ribs, while the bearing pedestals are cast integral with the one-piece lower housing. The rotor consists of a heavy main shaft of alloy steel, cast steel end disks and manganese steel rings or hammers.



Ring-roll laboratory pulverizer.

New Machinery and Supplies

Crushing and Grinding

Vertical Ball Mill Is Dustless, Self-Contained

The Traylor-Collins pulverizer mill, a 1935 development of the Traylor Eng. & Mfg. Co., is a compound vertical ball mill for grinding materials to fine powder. It embodies old and tried ideas, redesigned to form an improved mill of large capacity, high efficiency and economy of power consumption. It is simple in construction, self-contained, and occupies little space.

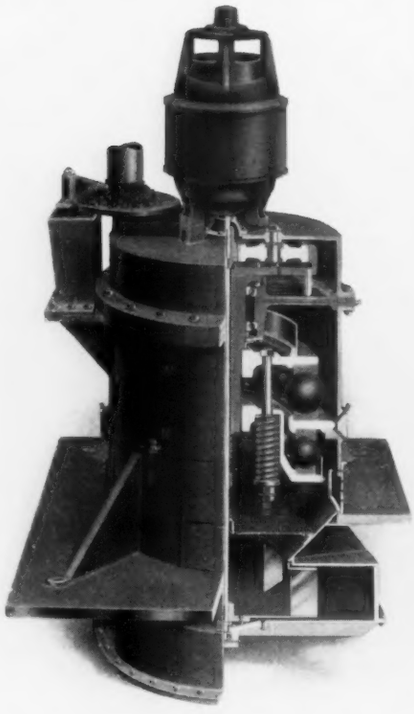
The mill is sturdily built of steel throughout and the working parts are easily accessible, permitting wearing parts to be quickly replaced at small cost. The machine is easily adjusted and maintained in operation. It is dustless, having tight joints and the interior under light suction, and all gearing is enclosed in oil tight, dust-proof casings provided with automatic lubrication.

The speed of the grinding balls is low to prevent centrifugal force from exerting destructive impact. The balls roll freely in grooved dies and sliding action is avoided. All bearings are roller-bearing equipped and the revolving elements are balanced, which eliminates vibration and results in silent operation. The grinding element operates at the most efficient speed, while the exhaust fan runs at maximum velocity.

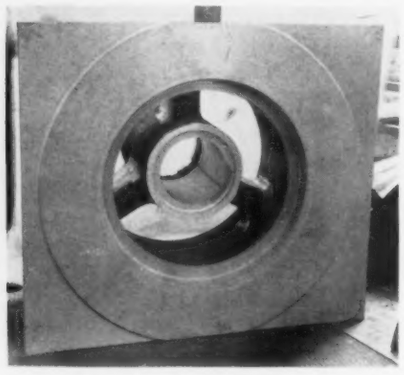
Alternative Type Bottom Shell for Newhouse Crushers

As an alternative design feature for its standard line of Newhouse crushers, Allis-Chalmers Mfg. Co. has developed a bottom shell that will discharge the finished product directly out through the bottom of the machine instead of collecting the crushed material on a diaphragm cast integral with the shell and delivering it through a discharge spout.

The alternative design has great advantage where the material from a series of crushers is all collected on a belt conveyor running underneath all the machines. This design is also satisfactory where crushers are located directly above a bin or hopper. It also has distinct advantages where the material is mined and is wet or sticky. In such cases the absence of any obstruction like a diaphragm allows the product to discharge from the crusher in the freest possible manner.

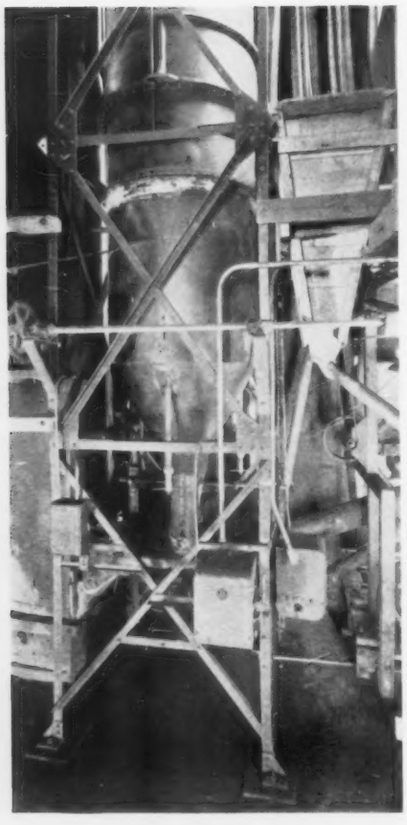


Compound ball-mill for fine grinding.



Bottom shell allowing direct discharge from Newhouse crusher.

Screening and Washing



New high-velocity air classifier.

Classifier Uses Air to Separate Fine Particles

The year 1935 saw the completion of the development of the new Wepreco standard classifier, by the Western Precipitation Co. This classifier differs from most of the other present-day classifiers in that it employs high-velocity air streams to separate or "wash off" the fine particles from the coarse material, and disperses aggregates of smaller particles.

The unit shown in the picture is installed at the Western Graphite Co. plant at Los Angeles, where it operates in circuit with a grinding mill to produce graphite of a fineness which may be varied at will from all-minus-150-mesh to all-minus-325-mesh. This particular installation has a capacity of from 1 to 3 tons per hour, but when this size classifier is operating in circuit with tube mills on cement raw material, its capacity is 12 tons per hour of kiln feed running 90 per cent, minus-200-mesh.

Hydraulic Classifier Developed for Sands

The Deister Concentrator Co. during the year developed a constriction plate classifier for the hydraulic classification of sands. It is a multiple type machine, provided with any required number of cells, each of which produces a separate classification of the material treated and discharges a different size spigot product. The operation of each cell as well as the size of material discharged as a finished product is under ready control.

These classifiers are furnished in sizes ranging from two-cell machines up to eight-cell or even more if necessary. The machine produces as many classifications as it has cells and in addition to this an overflow slime product. Generally the capacity is figured at two tons per hour per cell. This, of course, varies with the type of material being classified, the type of classification obtained and the range in which the material is being classified. Capacities of course decrease with the finer classifications.

Constriction-plate classifier.

Single-Deck Screen Designed for Fine or Medium Sizing

The Allis-Chalmers Mfg. Co., Milwaukee, Wis., announced that a new, sturdy, low-priced single-deck screen had been added to the "Aero-Vibe" line. This screen is suspended by cables and springs and is vibrated by adjustable counter-weighted wheels. It is designed to handle medium to fine-sized materials either wet or dry and is made in a wide range of sizes from 1½ to 3-ft. to 5 by 10-ft.

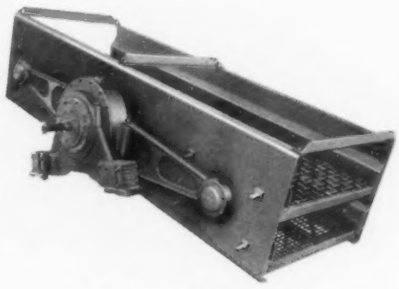
Bars of cantilever grizzly utilize new principle.

Bars of Cantilever Grizzly Unattached at Lower End

Cantilever grizzlies or cantilever bar screens bearing the Allis-Chalmers name, were among the productions of manufacturers during 1935. Claims are that the absence of bar-tie rods at the lower end eliminates the clogging often experienced with ordinary bar screens. The impact of the material on the grizzly causes the overhung free ends of the bars to vibrate horizontally, keeping the material from wedging. Thus, with higher efficiency, it can handle tonnage more effectively. The cantilever grizzly is declared to have the advantages of simplicity, first low cost, low maintenance cost, ease of operation and ease of repairs.

Positive Circle-Throw Screen Made in New Sizes

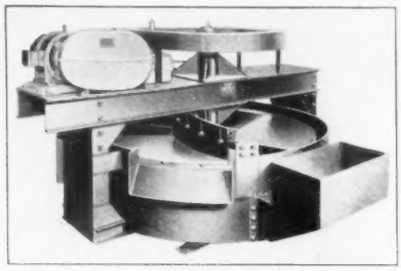
During the past year the Productive Equipment Corp., Chicago, announced a new size, Type VA Selectro vibrating screen, an exact copy of the larger Type VB, and incorporating advance engineering design. It is made in sizes from 18 in. to 30 in. width and 49 in. to 96 in. in length, in 1, 2 or 3 decks, in the open and fully enclosed types. The VA model is a positive circle-throw vibrating screen with such features as adjustable throw, oil lubrication, full floating, safety, ruggedness, quick cloth change, on size self-aligning bearings, etc. A compound eccentric, the parts of which may be adjusted in relation to each other to govern the amount of throw, is employed in the vibrator assembly. By adjustment of the two halves of the balance wheels the eccentricity of one can be arranged around the shaft so that it neutralizes the eccentricity of the other, or the eccentricity of both can be built up to create the greatest possible flow.



Circle-throw vibrating screen.

Perfect Device for Sand Recovery and Dewatering

The Link-Belt Dewatering Rotoscoop was announced as a perfected device for recovering fine or coarse sand and similar material by the Link-Belt Co. of Chicago. The Rotoscoop is described as a self-contained machine consisting essentially of a

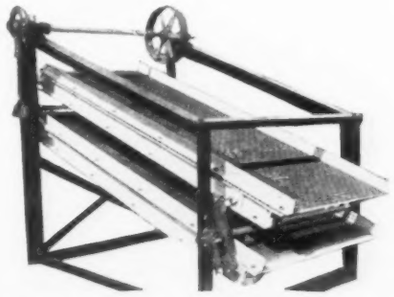


This device is for classifying and dewatering sand.

large steel tank ; a suspended rotating disk to the under side of which are attached inclined and adjustable renewable scoops for removing the material within the tank ; a curved steel adjustable plow mounted in a stationary position above the disc for discharging the watered product. The driving mechanism mounted above the tank, consists of a motor, an encased automatic-lubricating silent chain drive, and a closed worm-gear reducer.

Shaker Screen Is Adjustable for Throw and Stroke Length

A new shaker screen, operating in an all-welded steel frame ready to install, was announced by the Continental Screen Co., of Kokomo, Ind. It is operated by means of a drive shaft on one end of which is an eccentric that transmits an up and down motion to a horizontal shaft. On the latter arms are attached which the connected to



Shaker screen with opposed decks and adjustable stroke.

the upper and lower decks of the screen at each side, and which impart a forward and upward thrust to the decks. The throw can be adjusted to any degree, and three adjustments in length of stroke are available. Because of the directly opposed motion of the upper and lower decks vibration is kept to a minimum.

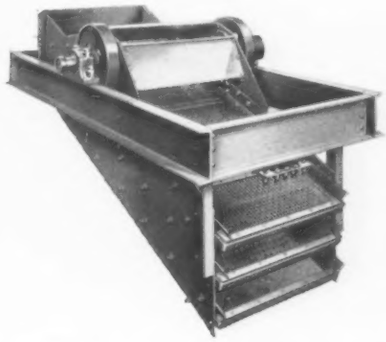
Mechanical device imparts horizontal shaking motion.

Mechanical Device Imparts Horizontal Shaking Motion

The Shaler shaker, a mechanical device for imparting a horizontal shaking or screening motion to a sieve, a conveyor, or any other unit demanding such motion, was developed by the Ajax Flexible Coupling Co., Westfield, N. Y. The shaker consists of two weights geared together so that when one is driven both weights rotate at the same speed but in opposite directions. The unit has positive lubrication by the splash system and can be driven either by belt or direct drive. It has full floating inner bearings, and the gear housing and inner bearing support member is cast integral with the central frame portion to insure true alignment of gears and driving shafts.

Horizontal Frame Used on Smith Pulsator Screen

A heavy-duty Pulsator vibrating screen, designed to screen sand, gravel or crushed rock, wet or dry, was produced by the Smith Engineering Works, Milwaukee. It is claimed that the eccentric action of the pulsator produces a circular movement which brings about a maximum screening action uniform at all points on every deck and under any load. The frame which carries the entire weight of the vibrating unit and dependent screen decks is made of heavy channels in the smaller sizes of screens and of I-beams in the large sizes. It is horizontal and supported from below on special rubber pads or by springs from cables. The vibrating unit actuating the screen decks is mounted on the frame and may be readily removed and taken apart in the field.



Pulsator vibrating screen with horizontal base.

Compressed-Air Machinery

Design Lightweight Drill for Soft Shallow Drilling

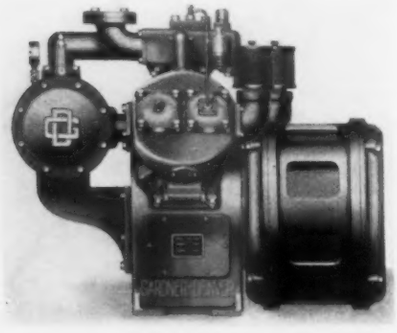
The new CP-22 dry sinker drill and the CP-22W wet sinker, both light weight units designed for shallow drilling in soft to medium formations were among the 1935 products of the Chicago Pneumatic

Low-air-consumption drill for use in restricted quarters.

Tool Co. The small size, light weight and low air consumption are said to make it an ideal drill for use in restricted quarters, flat and upward drilling, and where the air supply is limited. It also may be used for block-holing in quarries. The dry unit weighs 28 lb., has an overall length with retainer of 19⅞ in., has an economical drilling depth of 6 to 7 ft., and requires a ¾-in. air hose.

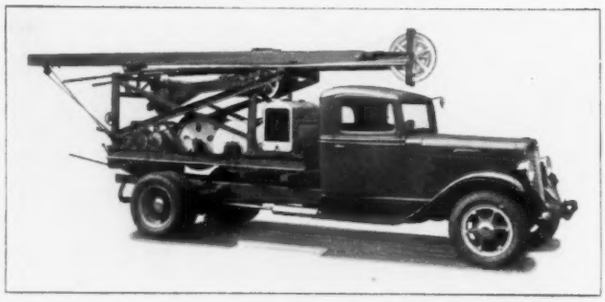
New Line of Compressors with Many Improvements

A new line of 3-cyl. air compressors known as "WBR" and available in sizes ranging from 113 to 194 cu. ft. per min. displacements, was announced by the Gardner-Denver Co., Quincy, Ill. A distinctive feature of the compressor is the use of two small low-pressure cylinders resulting in lower air temperature. Cylinder walls are water cooled to provide lower wall temperature with better lubrication and longer life. The two-stage construction, with



Compressor with one high pressure and two low pressures.

water-cooled cylinders and intercooler, is said to assure sustained high efficiency. A force feed pressure lubrication system is used. Pistons and cylinder walls are lubricated by the oil spray of the crank pin. The compressor may be run in either direction. The main bearings are of the Timken heavy-duty, tapered roller type. The crank shaft is of chrome-nickel-molybdenum alloy, ground to size and accurately counterweighed for best running balance. Connecting rods are of drop forged steel. Valves are of the "cushioned" noiseless automatic plate type.



Self-contained all-steel welded drill rig with shock-absorbing spudder.

Lightweight Sinker Drill Designed for Soft Drilling

The Gardner-Denver Co. also announced a new model S-35 light weight dry sinker drill especially designed for drilling in soft and medium formation and for plugging in quarries. The drill

Lightweight dry sinker drill for soft and medium formation.

weighs 28½ lb. complete, has a cylinder bore of 3¼ in. and uses ⅞ steel. Features of the drill include the full-grip handle, one-piece exhaust control and handl simple rugged steel puller, and totally-enclosed short-throw tubular valve, etc.

All-Steel Welded Drill Has Shock-Absorbing Spudder

The new Speed Star No. 71 drilling machine for water blast holes and mineral prospecting, was developed by the Star Drilling Machine Co., Akron, Ohio. The machine is said to be a completely sustained unit of rugged all-steel-welded-construction, having among its features a new shock-absorbing-spudder which is said to make the oil line operate as resiliently as manila cable and to allow operation at speeds up to 60 strokes per minute. In either raising or lowering the mast the top braces stay connected, folding under as the mast is lowered. The mast is 33 ft. high and telescopes to 22 ft.

Drill-Steel Cleaner Is Handy Tool for Quarry

Time and dollars may be saved in the quarry by the use of the new Pan-American built Schiffner hollow drill steel cleaner, recently offered the trade by Pan-American Engineering Corp., Ltd., San Francisco, Cal.

As the accompanying illustration shows, the plugged drill is inserted in the cleaner. Air is turned on and the hammers quickly

Drill cleaner in operation.

release the plug by a shattering action, dropping the pieces into a matched hole below. Air is then again employed to blast the bore of the hollow drill steel until it is thoroughly clean. The entire operation takes but a few seconds and the manufacturer sells the machine on this basis . . . "It cleans your drills, or it costs you nothing!"

Compressed Air Machinery

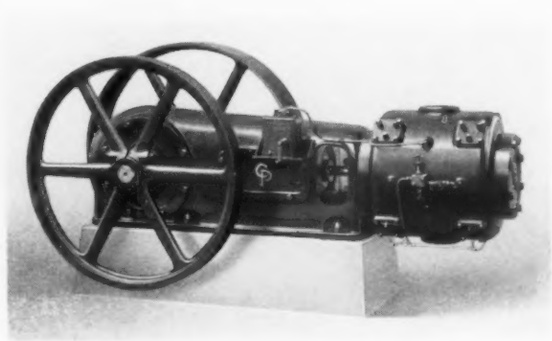
Churn-type drill of all-welded construction.

Churn Drill with All-Steel Welded Frame Uses Wire Line

The Bucyrus-Armstrong 21-W churn type for drilling holes 300-ft. in depth and 6-in. in diameter, was announced by the Bucyrus-Erie Co., South Milwaukee, Wis. This drill was said to make available the drilling action of No. 26 blast-hole drill and 26-P prospecting drills at a lower price. The 21-W is of welded all-steel construction capable of handling a thousand pounds of tools. It is equipped with the B-A rubber shock absorber, which makes practical the use of wire line. Power is furnished by a heavy-duty 4-cyl. industrial gasoline engine.

Horizontal Single-Stage Air Compressor Developed

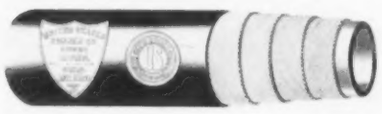
A new Type T. horizontal single-stage air compressor, the product of the Chicago Pneumatic Tool Co. was announced during the year. It is double-acting, water-cooled, arranged for belt or direct-connected motor drive, and has a capacity of from 89 to 123 cu. ft. per min. Features include Simplate valves, tapered-roller main bearings, wedge-adjustable connecting rod, inlet valve unloading system, double-counterweighted crankshaft and completely enclosed frame.



Horizontal double-acting single-stage air compressor.

"Tire-Like" Cord Layers Used in New Air Hose

A brand new type of hose for pneumatic tool and air-drill service—an air hose built like a tire—was one product of the Mechanical Goods Division of the U. S. Rubber Products, Ind. The body of the hose

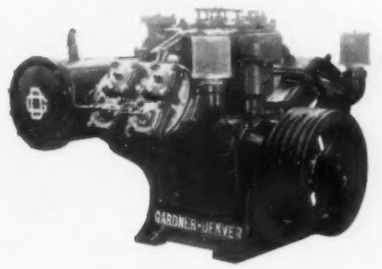


Auto tire construction in new air hose.

is made with each layer of "tire-like" cords laid in tough rubber cushions, isolated from adjacent layers to prevent rubbing or shearing. As a result, it is claimed, the hose will withstand pulsation, sudden expansion under pressure, or constant flexing in use.

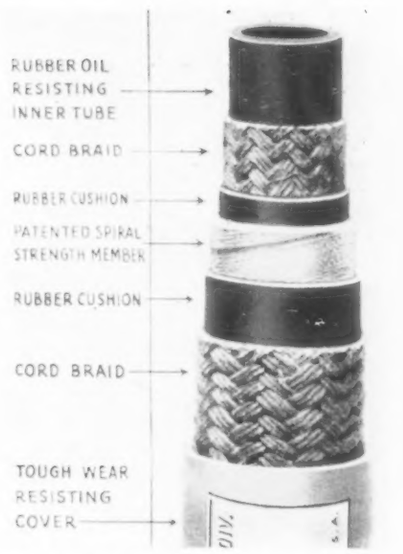
Design of This Compressor Departs from Conventional

The modern trend toward more delivered air-power, consumption and longer compressor life, was exemplified by Gardner-Denver engineers who developed a new 6-cyl. 2-stage water-cooled compressor. A



Two-stage water-cooled compressor.

departure from conventional compressor design is the use of four small-diameter low pressure cylinders, instead of two large ones, this construction permitting the use of small, lightweight pistons and considerably reducing the inertia loads. The use of two pairs of low pressure water cooled cylinders provides lower air temperatures than previously obtained in small vertical compressors, with corresponding saving in horespower. Distortion of cylinder walls from heat is eliminated, and, in addition, the compressor operates independently of atmospheric temperatures. A new 28-lb. sinker drill, known as the S-35, was also announced by the company. Owing to its light weight the new drill is said to be exceptionally suited for places inaccessible to a heavier drill, and especially suited for drilling in soft and medium formations, as well as for plugging in quarries or on construction jobs.



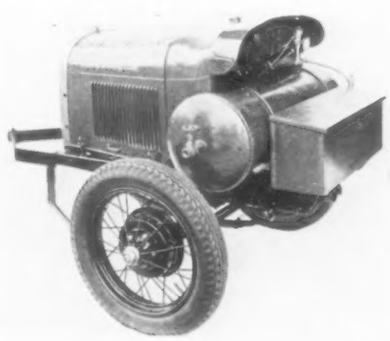
Sectional view of patented air hose.

Unequal Stresses Avoided in Compensated Air Hose

With the advantages of both wrapped duck and braided hose and with none of their weaknesses, a new air hose was developed by the Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc., Passaic, N. J. In the new construction, it is said, the unequal ply stresses set up in the wall of the hose by longitudinal and lateral tensions incident to operation, are compensated and made equal. By balanced construction internal friction and chafing are eliminated, and the construction effectively resists surge and pulsation. Compensated air hose is so strong that present day working pressures may be completely disregarded.

Convert Automobile Engine to Motor-Driven Compressor

A motor-driven compressor converted from a Model A Ford motor is the accomplishment of Gordon Smith & Co., Bowling Green, Ky. Cylinders 1 and 4 of this 4-cyl. motor are used for power and cylinders 2 and 3 for compressing the air. The head has the same combustion space area and water jacket over the power cylinders as the standard head, but has no water jacket



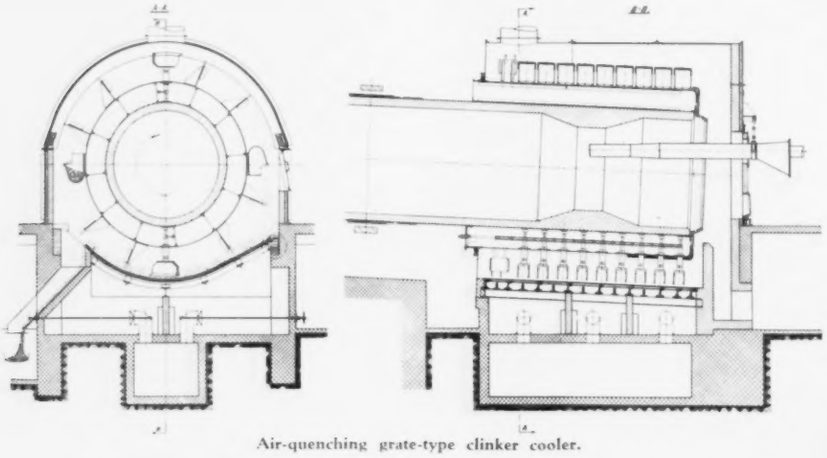
Portable motor-driven air compressor converted from automobile engine.

over the compression cylinders. At 1,500 r.p.m. the compressor has a displacement of 87 cu. ft. and can compress up to 175 lb. pressure. It is mounted on a two-wheeled trailer.

Burning and Cooling

Grate Clinker Cooler Uses Air Quenching Principle

The Unax grate cooler which was developed during 1935 by F. L. Smidth & Co. is based on the air quenching principle and consists of two parts, one stationary and one revolving. The stationary part comprises an insulated casing surrounding an outlet end of the kiln, and in the bottom of this casing is a stationary grate of rigid design. The revolving part of the cooler is attached to the end of the kiln shell and consists of conveying flights and scoops which rotate with the kiln. The hot clinker is discharged from the kiln through a screening ring and falls upon a layer of cool clinker resting upon and protecting the grate. As the kiln rotates, the flights and scoops convey the hot clinker toward the outlet end of the grate, spreading the layer at an even thickness over the entire area of the grate. Atmospheric air for cooling the clinker is supplied by means of a fan to various compartments beneath the grate. The air passes through the grate and the layer of clinker, the air thus being preheated to a high degree whereas the clinker is rapidly cooled. As the grate is stationary and always protected by a bed of cool clinker, and the other parts of the cooler revolve at a slow speed, the wear and tear is said to be very small.



Air-quenching grate-type clinker cooler.

Develop Kiln Block with Higher Heat Resistance

Superex Blocks, a Johns-Manville product, were improved during the year to provide even greater heat resistance through the use of a special calcined diatomaceous earth base which raises the temperature limit from 1600 to 1900 deg. F. Under the severe service to which insulation is subjected in rotary kilns, the method of installing the insulation and refractory lining is a matter of great importance. In addition to the high temperature involved, the lining must withstand rotation, vibration, abrasion, expansion and contraction and the continued impact of the heavy mass of clinkers. A method which is said to have met with unvarying success consists of 2½ in. of Superex blocks (2 in. at rivets) laid next to the shell in a bedding of insulating cement and followed by 6 in. kiln blocks.

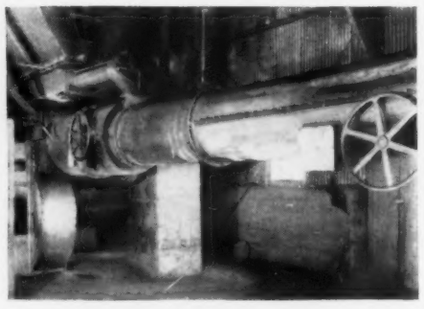
Kiln being lined with high-temperature resisting blocks.

Traylor Offers New Rotary Clinker Cooler and Burner

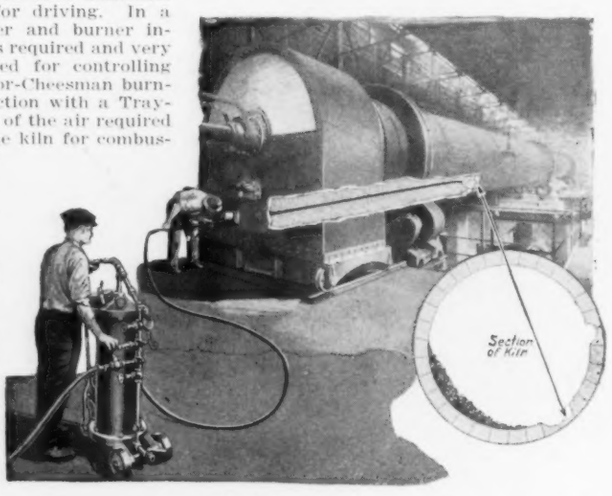
The Traylor-Cheesman patented rotary clinker cooler and the Traylor-Cheesman patented burner were offered as new equipment during the year by Traylor Eng. & Mfg. Co., Allentown, Pa. The former is a compact unit of three pass type, said to assure cooling of clinker to within at least 100 deg. of atmosphere, with full recovery of heat. Air introduced into the cooler travels counterflow with the clinker and is in intimate contact with the heat transfer elements. Two basic elements of heat transfer are utilized, namely, high velocities of gases, and ample heat radiating surfaces, in order to make the cooler very compact. The cooler is completely enclosed within a shell, and is accessible. Due to the distribution of the loads a minimum of power is required for driving. In a Traylor-Cheesman cooler and burner installation only one fan is required and very little attention is needed for controlling the air. When a Traylor-Cheesman burner is operated in connection with a Traylor-Cheesman cooler, all of the air required for cooling is used in the kiln for combustion. The clinker is spouted into a brick-lined cylindrical chamber provided with lifters to shower the material, which then enters three or six flues formed in the annular space between the outer shell and a center tube, at the lower end of the cooler. The clinker moves through these flues to the ends, at the discharge end of the cooler, where it is spouted into the center tube, which is provided with spiral lifters to cause the clinker to move toward the feet end. At the forward end of this tube the material is spouted into the other three, or "cold" flues, in which it again moves toward the discharge end. At the lower end of these flues the clinker is discharged into an annular trough built with lifter buckets which elevate it into a fixed discharge spout. The six flues are fitted with lifters, and chains to hasten transfer of the clinker heat to the air. The air moves through the cooler counter-current to the clinker, in order to maintain a constant temperature differential, thereby assuring a uniformity in the physical condition of the clinker. Thus the air is gradually heated and attains its highest temperature when passing through the brick-lined receiving chamber, whence it is drawn into a cyclone and thence blown into the kiln burner. The brick-lined chamber is about half the length of the cooler, but due to the three pass arrangements in the lower half of the shell the air travels about twice the length of the cooler.

Plastic Kiln Refractory Applied by Air Gun

The Quigley refractory gun for scientific mechanical application of refractories in mechanical form, was one product during 1935 of Quigley Co., Inc., of New York. With this gun, it is said, it is possible to fill cracks or holes, restore burned-out walls, surface new walls or resurface old ones, repair leaky baffles and build new monolithic baffles that are air and gas tight. One advantage claimed for the gun is that it handles premixed, properly seasoned refractory mixtures of the proper consistency for the job. Because of the force of application it is said the mixture will stick to hot or cold surfaces where troweled application might fail to hold The gun has a capacity of 2 cu. ft. of mixed refractory material.



New burner which gives complete control of air and combustion in kiln.



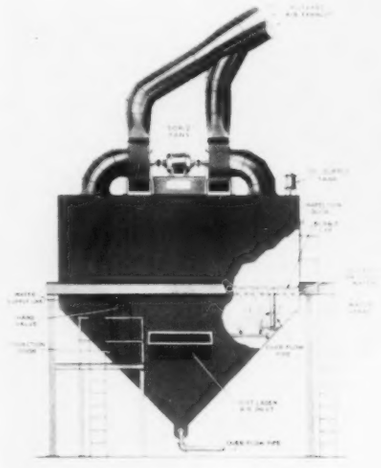
Pressure gun for mechanical application of plastic refractories shown in use on rotary kiln.

Dust Collection

Oil Froth Removes Fines in This Dust-Collector

The development by the C. O. Bartlett & Snow Co. of its line of "froth flotation" dust collectors follows the basic theory long held by engineers that an air stream, passing through a blanket of low-surface-tension material is shorn of its dust loading.

In the Bartlett & Snow collector, dust-laden air is drawn through ducts to an equalizing chamber. It is then passed upward through "bubble caps" into a water bath which is covered with



Froth flotation dust-collecting system.

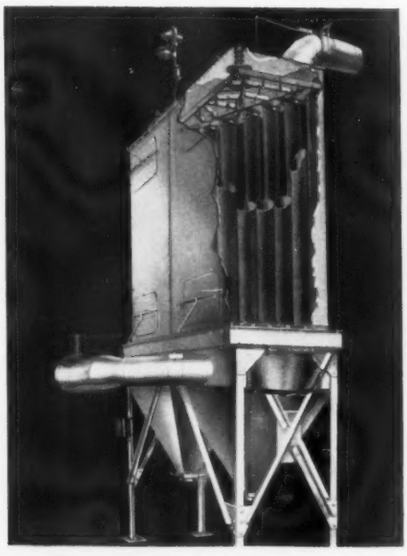
an oil carpet and discharged from the upper chamber with a fan. Larger dust particles are removed in the water, while the fines are trapped in the oil carpet, or froth, covering the water. There are no moving parts except the fan and the action is entirely automatic. The machines are compact, of all-steel construction, and inexpensive to operate. Repeated tests on dust, 25 per cent. of which passes a 200-mesh screen, have shown an efficiency of not less than 99.8 per cent. by weight.

Standard sizes of the dust collectors range from 1,000-cu.ft. machines to those capable of handling 35,000 cu.ft. per min.

Static Pressure Control Features Dust-Collector

The American Foundry Equipment Co., 430 Byrkit St., Mishawaka, Ind., announced the new American continuous dust collector with static pressure control. This control automatically maintains a constant minimum static pressure loss in the filter and regulates the cleaning of filter cloth. This is said to result in constant and effective dust removal from the equipment being served, reduced fan operating cost, less power, more flexible operation, and reduction in the size of the required dust collector.

The dust-laden gas or air enters the hopper of each unit into which is built a primary separator made up of concentric baffles, the outer one being cylindrical and the inner one conical. The modified cyclonic action set up is said to deposit only the particles large enough to cause excessive wear while the remaining dust is carried to the filter bags. Suction draws the air through the bags. At a determined point of allowed static the automatic differential control unit, through a mercoid switch, starts the timer motor which controls the cleaning cycle. In predetermined

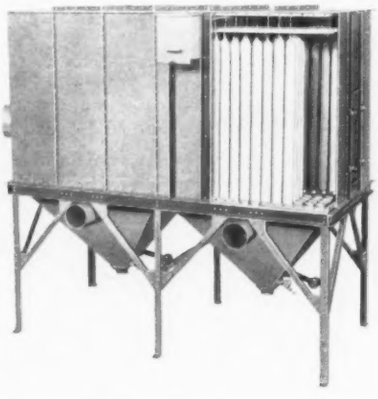


Dust-collector using static pressure control.

cycles each unit is in turn automatically cut off the line, cleaned for about five seconds, and put back into operation. A compressed air cylinder moves the bag supporting the spider up and down very rapidly to break the deposited dust loose from the bag walls. The cleaning cycles are controlled solely by the gradual building up of the layer of dust to the point where efficiency would begin to drop by reason of the resistance caused by the dust.

Dust Filter Designed for Accessibility of All Bags

Ruemelin Mfg. Co. of Milwaukee, Wis., makers of Dust Filters for the past 15 years have recently improved and patented new features on their filters. Their filters are principally used for eliminating the dust hazard or reclaiming valuable dusts from exhaust or ventilating systems. The filter tubes are enclosed in a heavy-gauge steel housing which is rigidly re-enforced to withstand high vacuum. A large door is provided in the end of the housing and an aisleway runs the entire length for access-



Bag-type dust-collector with part of housing removed to show interior.

sibility of all bags. The dust hoppers have rubber-seated dust valves and the valve levers agitate the dust inside the hopper to prevent arching. When desired, a fan and motor housing can be furnished as an extension to the filter housing.

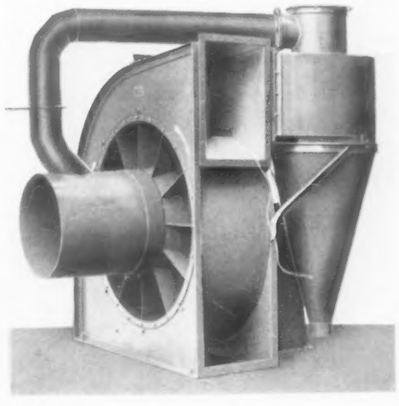
These filters are made in standard units of 1830, 1375 and 915 sq. ft. cloth area and are based on a ratio of 3 cu. ft. of air per minute per sq. ft. of cloth. Bags are suspended from hanger rods attached to the ceiling of the housing and the bottoms of the bags are telescoped over shouldered collars and provided with felt seals and special wire clamps. The shaking mechanism consists of an electric motor and cut gear transmission which transmits a rapid vibrating action to the bags through the shaker rods.

The filter operates in the usual manner. The suction of the exhaust fan delivers the dusty air into the dust hopper where heavy particles are removed. The clean air passes through the cloth bags depositing all smoky dust on the inside surface of the bags. A settling or pre-separation chamber can be furnished where it is advisable to remove the heavy material before it is filtered through the cloth tubes.

Dust-Collector Made of Electrically-Welded Plate

The American Air Filter Co., Inc., Louisville, Ky., developed the new Type F Roto-Clone. The paramount reason for developing this new type of Roto-Clone was that the upper limit or size in the cast-iron construction was reached with the No. 24 Type D and larger sizes could be built only in steel plate construction in order to stay within practical limits of weight and manufacturing costs.

The new design is built of heavy plate, ranging from 3/16-in. thick for the small sizes up to ⅜-in. thick for the larger sizes and is electrically welded throughout. The impeller disk is a flat plate laminated for uniform strength. The blades are straight instead of curved but are fastened to the disk at an angle and inclined toward the direction of rotation. The dust scroll is parallel with the air scroll and is separ-



Dust-collector of welded steel-plate construction.

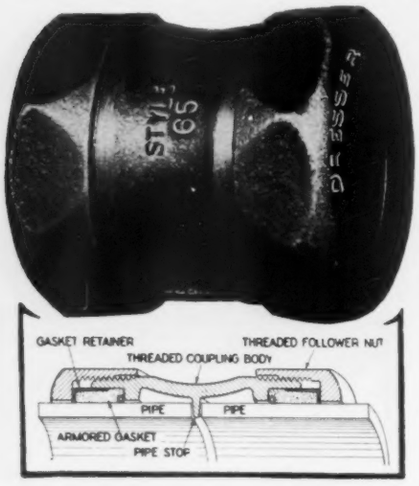
ated from the air scroll by means of a splitter plate. All models are belt-driven and the shaft is carried by two ball or roller bearings.

The Type F Roto-Clone consists of the Roto-Clone or precipitator, concentrator, return air connection and short inlet piece at Roto-Clone intake. Depending on the total pressure of the system, from 6 to 10 per cent. of the primary air enters the dust scroll. This secondary air, together with the dust, passes into a concentrator which is mounted directly on the Roto-Clone and which separates the dust from the secondary air. The dust is discharged at the bottom of the cone and the air is returned to the Roto-Clone inlet. A damper in the return line makes it possible to adjust the air volume in the secondary circuit.

Pumps and Fittings

New Compression Coupling for Connecting Pipe Ends

Among the 1935 products of manufacturers was a new, self-contained pipe joint announced by the S. R. Dresser Mfg. Co. of Bradford, Pa. To make a connection with this new joint, called the Dresser Style 65 Compression Coupling, nothing is needed except the pipe, the joint itself and

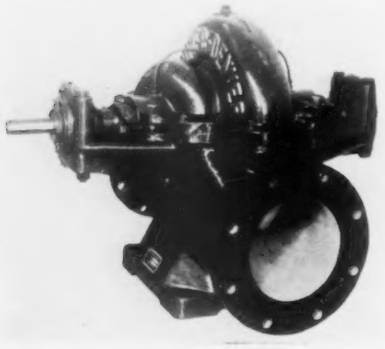


Self-contained pipe coupling.

an ordinary wrench. Making the joint simply involves inserting the pipe ends into the coupling and then tightening two threaded octagonal nuts. As the nuts are tightened, two resilient "armored" gaskets are compressed tightly around the pipe, gripping it with great force and giving a positive seal. The principle involved is essentially the same as that used in other Dresser couplings. The resulting joint is said to be not only permanently tight but absorbs normal vibration, expansion and contraction movements, and permits deflections of the pipe in the joint. The pipe need not be cut to exact lengths; joint making in cramped quarters is simplified; repairs on old lines can be easily made; and the joint is suitable for exposed lines because of its compact appearance.

Double-Suction Pumps Are Highly Efficient

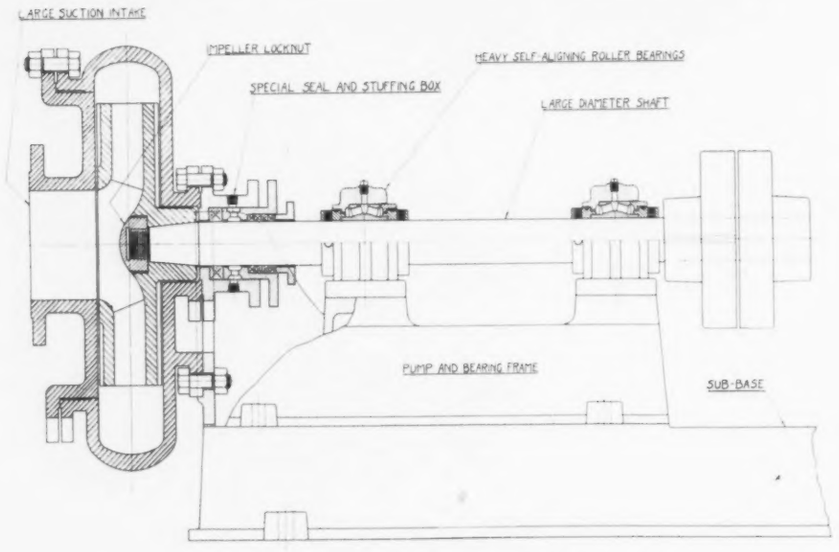
A new line of double-suction centrifugal pumps for high-efficiency service was the contribution of the Gardner-Denver Co., Quincy, Ill. These pumps are the single-stage split-case type and are designed for any type of drive, including flat belt, V-belt, direct-connected, gas or Diesel engine, although the usual drive is direct-connected to an electric motor. All pumps in this line, known as series D, E, F and G, are identical in construction, the only difference being the dimension. This series covers all heads up to about 300 ft. The shaft sleeve nut is on the outside of the pump and next to the pump housing, a convenience in tightening sleeves. This nut is also used as a jack to remove the ball bearing, no puller being required. The bronze impellers are of double-suction enclosed type, hydraulically balanced. The casing is of cast iron and the casing is split on the horizontal center-line to permit access to the interior without disturbing the pipes.



Double-suction centrifugal pump for high efficiency.

This Centrifugal Pump Is Designed to Handle Slurry

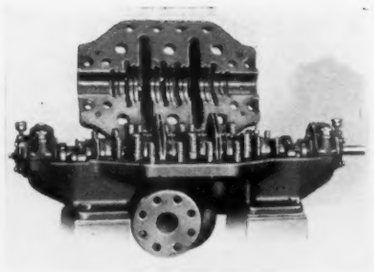
The "Lawrence" slurry pump, designed specially to handle this material, was a product of the year from the Lawrence Machine & Pump Corp., Lawrence, Mass. The manufacturers state that only three parts of the pump come in contact with the slurry and are subject to wear, these being the shell, the impeller and the suction disc. These parts are of simple design, extra heavy, and are made of wear-resisting alloy iron, with a Brinell hardness of from 600-700. The shell is made extra thick with flanges for bolting to the disc and slots are used in the flanger instead of bolt holes. The impeller is locked securely on the shaft with a taper fit and a nut which fits into a recess in the hub. The impeller is of the enclosed type with large clearances and passageways. The pump and the bearings are mounted on a separate frame or base and the whole unit can be lifted out for overhauling and replaced readily with another unit without disturbing the sub base, the motor or the piping. All parts of the pump are renewable and interchangeable. The suction intake is made larger than the discharge and is carried all the way back into the eye of the impeller. A double stuffing box with a water seal chamber in between is used, the pressure on each set of packing being regulated independently.



Cross-section of pump designed especially for slurry handling.

Multi-stage Pumps Use Double-Suction Runners

Type "MM" multi-stage pump, developed during the year by Allis-Chalmers Manufacturing Co., for heads from 400 to 1600 ft., and capacities up to 400 gallons per minute, is designed along the general lines of the Allis-Chalmers Type "M" pump. They are horizontal shaft, split casing, double suction, bronze fitted, and

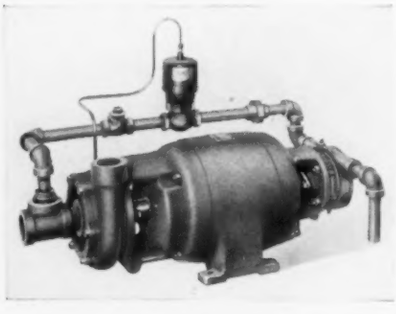


New multi-stage pump.

are said to be particularly economical for boiler feed, mine drainage, sluicing and other high head pumping services.

New Centrifugal Pump Has Automatic Positive Primer

During the year the Worthington Pump and Machinery Corp., Harrison, N. J., announced an automatic self-priming Monobloc centrifugal pump without floats, hand-operated valves or recirculation. This was accomplished through the use of the Worthington-built Hytor, which is a positive primer placed on the same shaft as the motor and pump. When the pump is primed a pressure-operated cutout automatically unloads the Hytor. The only requirement is said to be a reasonably tight suction line. The unit has a splash-proof streamlined motor all on a symmetrical mounting.



Centrifugal pump with automatic self-priming feature.

Other Equipment

Portable gravel-washing and screening plant.

Portable Gravel Plant Is Great Performer

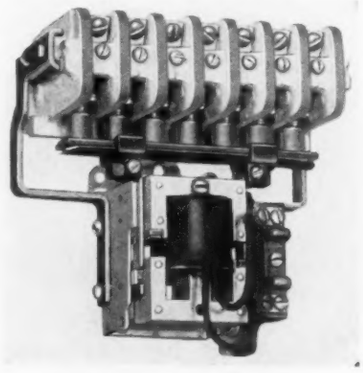
The Austin-Western Co. has developed and is marketing a complete portable gravel-washing plant which will greatly interest commercial producers of washed aggregate, as well as portable producers.

The machine is equipped with a large gyrating screen, which classifies the pit material into three predetermined sizes. High-pressure water nozzles which thoroughly soak the incoming material. The three smaller sizes of material are delivered to three separate inclined tanks which are fitted with screw conveyors which accomplish a thorough scrubbing action and at the same time dewater the clean aggregate. This machine is a compact unit all mounted on roller bearing wheels, making it possible to operate either in small road side pits or in large established pits. This plant which has a capacity up to 125 cu.yd. of material per hour has the same capacity and will do the same job as many stationary plants involving an initial investment of several times as much.

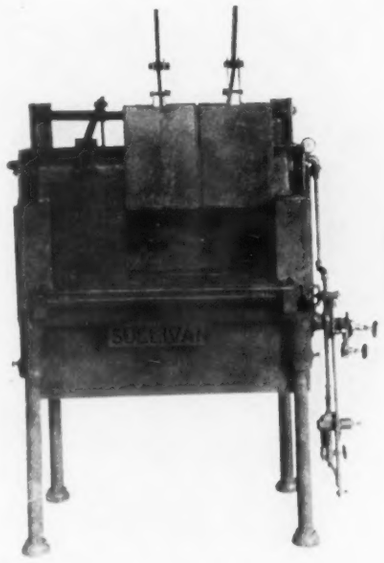
New Multipole Contactor Has 2-Hp. Rating

A compact new multipole magnetic contactor, designed as Size 0 and rated 2 hp., was announced by the General Electric Company, Schenectady, N. Y. It is intended for use either with small single-phase and polyphase a-c. motors, or as a flexible relaying device for complicated control systems.

The new contactor is available with either normally open or closed contacts, or with a combination of both. It may be controlled remotely through push-button stations, limit switches, or other pilot devices. Any two forms of the contactor may be combined and mechanically interlocked either vertically or horizontally. A self-contained device, it is easily installed, and can be mounted either as an open-type contactor or as an enclosed switch, for it is also obtainable with enclosing cases. The latter are compact and round-cornered with conveniently located knockouts.



Multiple magnetic contactor.



Well-bit furnace.

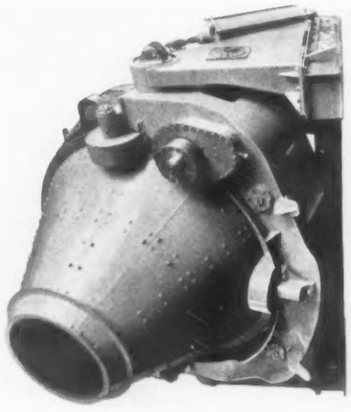
High Efficiency Noted in Well-Bit Furnace

Included in the Sullivan Machinery Co.'s line of furnaces is the new GF-4 well-bit furnace. This weighs 2900 lb. less equipment, and has a hearth opening of 10½ in. wide by 34 in. long, accommodating three 9-in. bits. Efficiency is the most notable feature in the performance of this furnace. The floor brick is made from "carbofrax," a very durable yet excellent heat conductor. This material is hard enough to stand any strain which a heavy 9-in. bit will put upon it; its conductivity enables one to heat the bits quickly. The design of the furnace is such that graduated heating is obtained, inasmuch as a bit can be started in the cool end of the furnace and gradually rolled up to the hot end.

The front of the furnace is closed off by a series of baffle doors. These doors can be adjusted to any desired opening, and the length of the active hearth also can be reduced. This means that this highly efficient furnace can perform a multitude of jobs of every size.

Tilting Mixer Designed for Coulee Dam Project

Outstanding among the 1935 developments of the Koehring Co. was the 4 cu.yd. concentric zone tilting mixer developed for the Grand Coulee Dam project. Eight of these machines will be pouring concrete for the dam. These mixers are charged and discharged through the same opening. The drums have only one opening, 38 in. in diameter, thereby utilizing a greater portion of the drums for mixing. Tilting to the discharge position and return to mixing position is accomplished by means of



View of the tilting mixer.

two pneumatic air rams. The completion of each travel is air-cushioned. The drive is direct through enclosed reduction gear to the drum, thereby eliminating chain or belt drive and motor couplings. The design permits installation of batteries of 2, 3 or 4 mixers for charging from one proportioning plant.

This new type tilting mixer can also be had in the 2 cu.yd. size with the similar important features.

Pioneer in Belt-Idler Field Improves Product

The past year witnessed a revival of activity on the part of the makers of the "Conweigh" trougher, coined from the name, Conveyor Weighing Co., which company was taken over by the Portable Machinery Co., a division of the A. B. Farquhar Co., at York, Pa. The Conveyor Weighing Co. claimed they were the originators of the first anti-friction troughers.

The Portable Machinery Company, of York, Pa., in addition to developing a complete line of portable conveyors with a wide range of application, has been developing the Conweigh trougher for use in building conveyors of the permanent type. The Conweigh idler, identified to the trade as "Conweigh Trougher No. 25," is now available with ball bearing or roller bearing construction, and with features for positive lubrication and dust exclusion, which in the opinion of its makers give it an efficiency in keeping with the Conweigh prestige as the original anti-friction idlers. A folder entitled "Conweigh Belt Conveyors," is free for the asking, and contains valuable engineering data of help in solving conveyor problems.

Other Equipment

Develop Method of Arc-Welding Manganese Parts

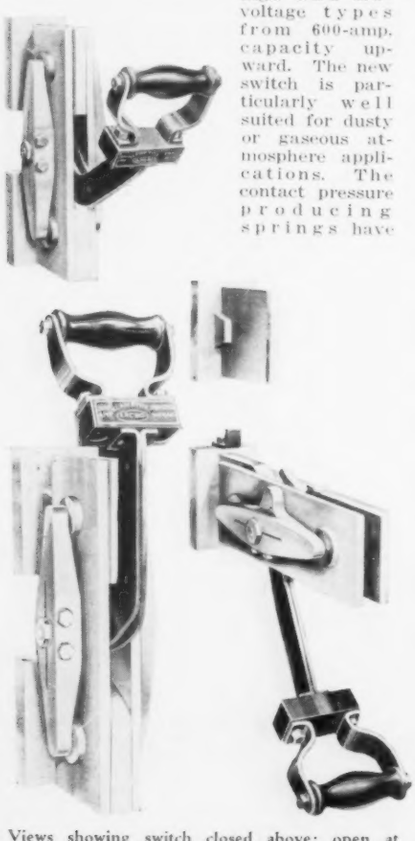
A new method for reclaiming worn down and broken parts such as crusher plates, gyratory crusher bells, buckets, centrifugal pump shells, shovel and dipper teeth, etc., was developed by the Stulz-Sickles Co., Newark, N. J., in the manufacture of

Jaw crusher plate shown after welding on nickel-manganese applicator bars.

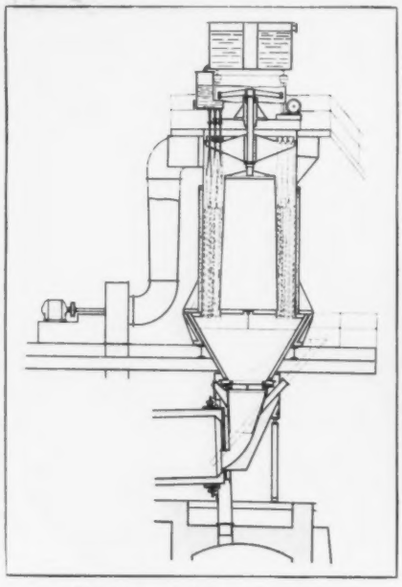
Manganal 11 to 13½ per cent. nickel manganese steel welding electrodes, applicator bars and forged wedges. The rebuilding of these parts with applicator bars and forged wedges is said to be a forward step in the reclaiming of these parts because of the fact that the comparatively small amount of heat required practically eliminates danger of warpage.

Special Type of Knife Switch for Dusty Places

The Automatic Reclosing Circuit Breaker Co. of Columbus, Ohio, announced a knife switch known as the Klamp-Tite, available in single- and multiple-pole styles in high and low-voltage types from 600-amp. capacity upward. The new switch is particularly well suited for dusty or gaseous atmosphere applications. The contact pressure producing springs have been kept outside the current-carrying circuits. The switch is first closed and then automatically clamped with thousands of pounds pressure on the contacts. When in the closed position, the contact joints have, it is claimed, a full-load drop equal to only one-third that of old-style switches and the switch thus meets most engineering specifications for voltage drop on bolted bus-bar joints. There are no spring jaws to anneal on overloading and the operator's hand is beyond the danger-zone in opening and closing. During the opening and closing cycles two distinct effects are produced. In moving from the open position to the closed position the blades slide over the contact studs with a complete wipe and under the customary knife-switch pressure. In moving from the closed position to the clamped-shut position, the blades remain stationary, while the handle becomes a wrench handle and rotates a clamping bolt, thereby tightening the clamping bars.



Views showing switch closed above; open at right, and clamped at left below.



Vertical waste-heat slurry drier.

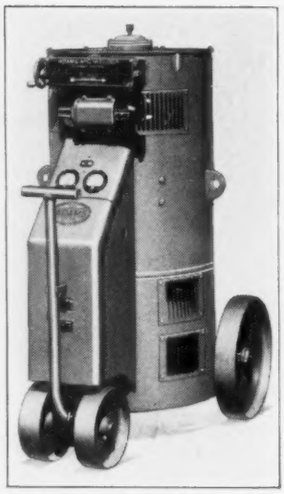
Waste-Heat Slurry Drier of Vertical Chain Type

A slurry drier designed to utilize the waste heat from wet-process kilns is known as the Polysius and is the product of the Polysius Corp., Bethlehem, Pa. Chains suspended in the annular space serve as heat exchange bodies and the slurry feed is through jets at the top. The gases from the kiln first encounter the dried slurry and as they leave the chain system the liquid slurry removes much of the dust. A suction fan collects the exit gases and steam.

The chains are suspended from a system of rotating brackets which are electrically controlled so that the direction of rotation is automatically changed at intervals. The swinging motion of the chains resulting is said to prevent clogging of the chains by the slurry. The chains can also be given a vertical motion. A gas-tight head connects the lower end of the drier to the kiln and a horizontal damper allows short-circulating the drier, the gases passing direct to the dust chamber and stack. A number of large doors give easy access to the interior of the drier.

Arc Welders are Portable and of Vertical Design

A new line of portable electric arc-welding machines of vertical design were put on the market by the J. D. Adams Co. of Indianapolis, Ind. Advantages claimed for the vertical type of welding are: Gyroscopic stabilization of dynamically balanced rotating parts reduces vibration to a minimum and there is no end float in the armature shaft.



Portable arc-welder of vertical design.

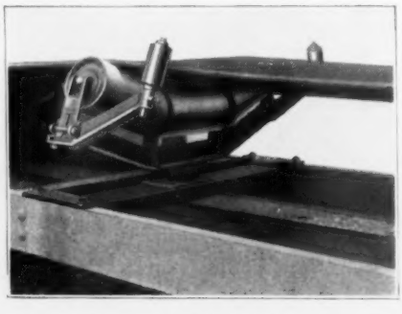
Flat Belt Cutter Uses Entirely New Principle

A flat belt cutting tool employing a new principle was announced by the Flexible Steel Lacing Co., Chicago. The cut is made by pushing the knife through the belt from one edge to the other. The knife is mounted on a plunger in a slot and is easily operated.

New type of belt cutting tool.

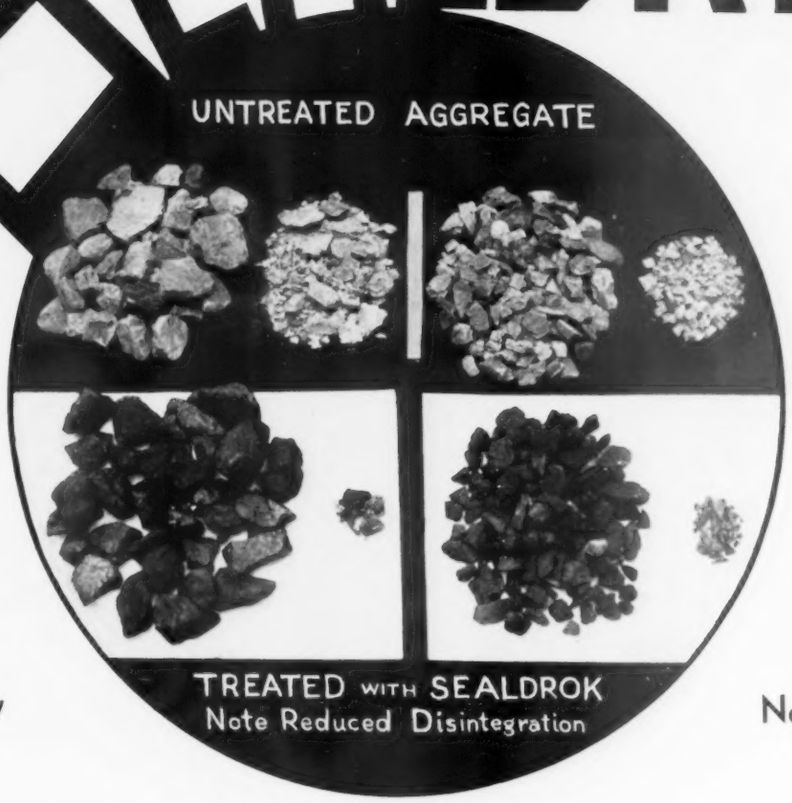
Self-Aligned Idler with Standard Carrying Roll

A positive self-aligning, anti-friction idler for troughed conveyor belts was announced by the Link-Belt Co., Chicago. The idler is made up of standard belt-carrying rolls mounted in a supporting frame provided with arms extending parallel with and at the sides of the belt on which actuating rolls are mounted for the purpose of swiveling the idler frame promptly when the crooked running belt crowds side-wise enough to engage either of them. Their operation is said not to be affected either by the speed of the belts or the load on it.



Self-aligning, anti-friction idler.

SEALDROK



Visit the Sealdrok booth at the Aggregates Show, Hotel Jefferson, St. Louis, January 27-31.

Read Results of these Tests below

Sensational New Development

WATERPROOFED MINERAL AGGREGATE

With the widespread revival of road construction, there is a growing demand for a more durable and efficient type of cold-lay asphalt mixtures for bituminous pavements.

The development of the Sealdrok Process of waterproofing mineral aggregates now offers a complete answer to this problem. Sealdrok is a special asphalt-base waterproofing compound entirely free of greasy liquifiers ordinarily used. It penetrates and impregnates the aggregate so thoroughly that it locks out moisture and frost from the finished paving surface, provides greater bond between the asphalt cement coating and the aggregate, and insures a more lasting pavement of uniform texture and surface.

The superior durability of Sealdrok treated aggregate is demonstrated by the well known Sodium Sulfate Test. An exhaustive series of 5-cycle tests, conducted by Dr. Herbert F. Kriege, Ph. D., on untreated and Sealdrok treated aggregate, shows the most astonishing results, as indicated by the following figures.

The photograph illustrates these test results, as reported by Dr. Kriege, Consulting Chemical Engineer of Toledo, Ohio, on two different sizes of aggregate. The figures show the comparative break-down as follows:

	Size ¾" to 1½"	Size ¾" to ⅜"
Treated	2.7%	5.2% Disintegration
Untreated	24.1%	14.0% Disintegration

Note in the photograph the large percentage of sluf-off from the untreated stone, as contrasted with the almost negligible amount from the Sealdrok treated stone. This definitely and strikingly shows the greatly increased durability of Sealdrok treated aggregate—the key to better and more efficient methods.

The time is fast approaching when mineral aggregate producers will be required to furnish treated aggregate from their source of supply for all bituminous paving construction.

PREPARE NOW to build stone and gravel secondary roads and farm-to-market roads with Sealdrok Waterproofed Aggregate—the positive preventive of destructive action by water and frost.

PRODUCTION of Sealdrok Waterproofed Aggregate can be done economically in any existing plant—no new equipment necessary.

SPECIFICATIONS furnished for:

- **Sealdrok Waterproofed Aggregate to be stockpiled for maintenance purposes; asphalt cement to be applied on the job:**
- **Sealdrok Waterproofed Aggregate treated with heavy compound for farm-to-market or secondary highway construction:**
- **Sealdrok Cold-Lay Finished Paving Mixture to meet Class "H" and Class "I" bituminous pavements.**

Write today for SEALDROK SPECIFICATIONS.

AMERICAN SEALDROK, INC.

135 South La Salle Street, Chicago, Illinois

Other Equipment

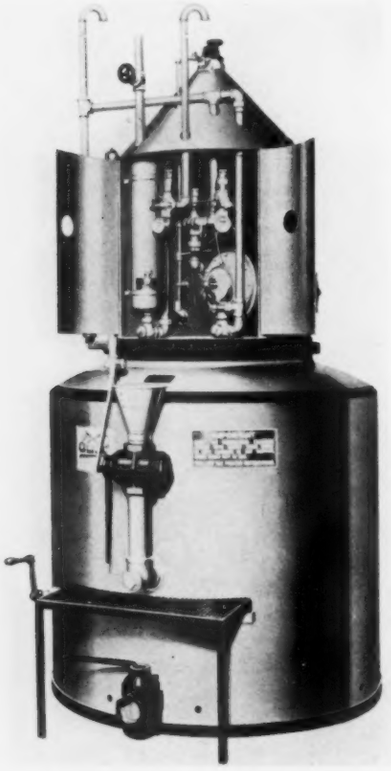
Two-wheel derrick for use with tractor.

Derricks Built for Quick Connection to Tractor

A new two-wheeled derrick for use with tractors was announced by R. G. LeTourneau, Inc., Peoria, Ill., and Stockton, Calif. It consists of but three main parts: boom, tongue and wheels, and is operated by means of a two-drum power unit mounted at the rear of the tractor. Line speed varies from 65 to 400 ft. per min. depending on the rigging. Capacities depend on size of tractor.

Generator Is New Welding Development

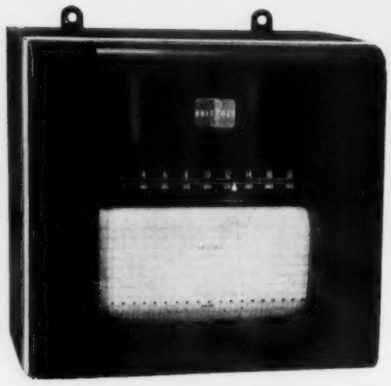
An important addition to the acetylene generating equipment of the Linde Air Products Co. during the past year was the new automatic stationary generator known as the Oxweld Type MP-5, rated to deliver 1,000 cu. ft. of acetylene per hr. The design is compact and efficient. The feed is of the gravity type, and the control is self-contained and is bolted to the inside of the carbide hopper.



Automatic stationary acetylene generator.

Safety Shoes Have Light-Weight Spring-Steel Guard

The Portable Lamp and Equipment Co., Pittsburgh, Pa., is distributing the new Strauss foot-guard to the mining industry, a device designed to protect the feet from falling or rolling objects. This new, light-weight guard, made of high carbon spring steel, grips the sole of the shoe beneath the instep. A flat spring, mounted on the inside of the guard and free on one end, rests on top of the shoe and permits the guard to ride clear of the floor. The guard stays in place, allows free movement of the foot and tests 3600 load pounds.



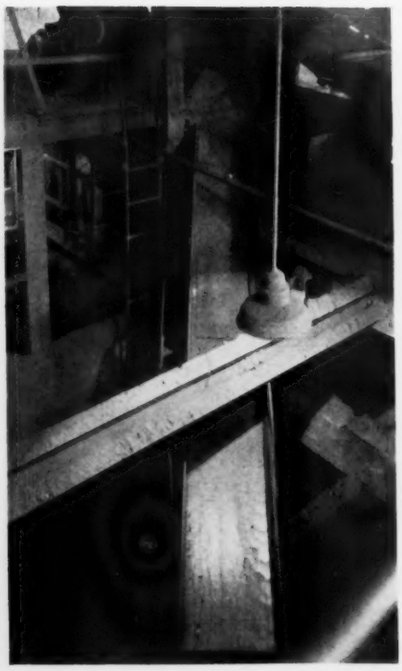
Pyrometer gives wide-strip record.

Wide-Strip Pyrometer Uses Potentiometer Principle

As an addition to its line of industrial instruments the Bristol Co., Waterbury, Conn., has developed the "wide-strip" pyrometer, which is available in single-record, multiple-record and recorder-controlled type. The instrument operating on the potentiometer principle of temperature measurement, has a built-in accuracy that is made possible through simple measuring, balancing and recording mechanism. A stainless steel lead screw, operated by an electrical motor under the direction of two galvanometer-controlled contacts, adjusts the slide-wire contact and recording pen unit to maintain e. m. f. balance in the potentiometer system. This mechanism, it is said, introduced an entirely new principle into temperature measurement.

Long Life and Ductility Claimed for New Steel

Joseph T. Ryerson & Son, Inc., Chicago, Ill., announced during the year a new abrasion-resisting steel which was developed to withstand the abrasion and wear common in the nonmetallic mineral industries. Applications include screens, conveyors, chutes, mixers, etc., handling sand, gravel, stone, concrete, and other materials. The new steel is said to be hard and tough and to have the maximum ductility consistent with this hardness so as to permit necessary fabricating operations.

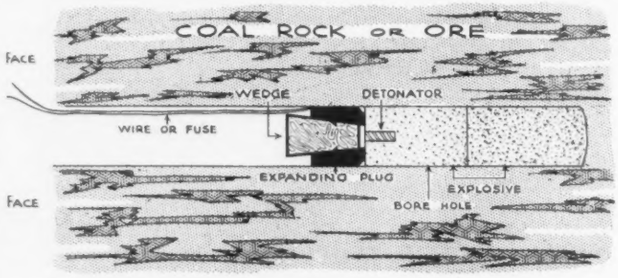


Chute lined with abrasion-resisting steel.

A life of from two to ten times longer than from commercial soft steel is claimed.

Heitzman Announces New Safety Blasting Plug

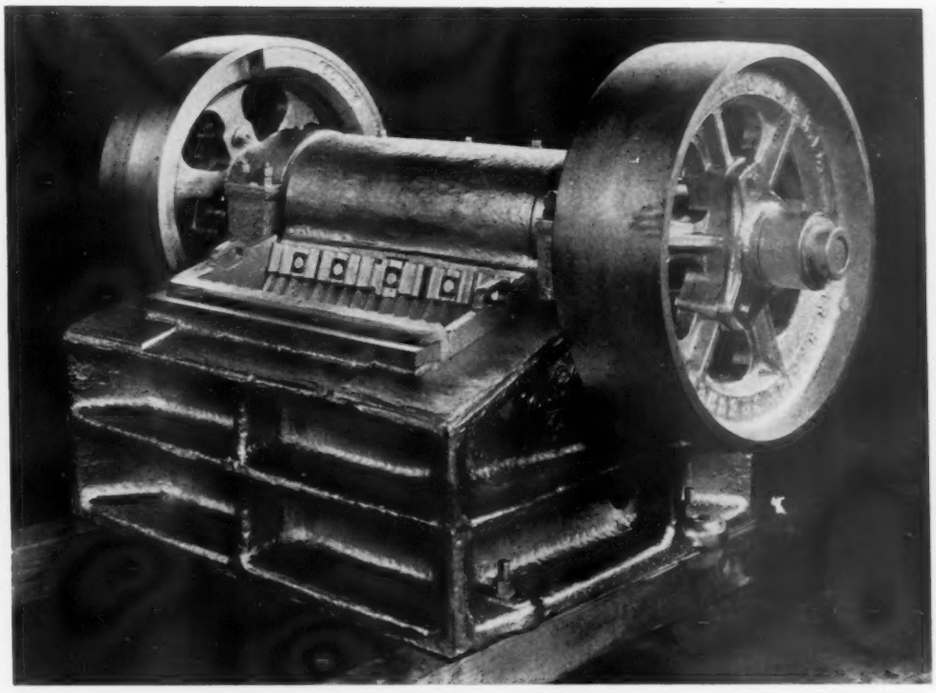
The Heitzman Safety Blasting Plug Co., 1310 W. Pine St., Shamokin, Pa., announces the improved Heitzman safety blasting plug, which is said to not only make drilling in a misfired charge impossible but also to eliminate the necessity of stemming with dirty bags. The plug is a simple affair consisting of a cylindrical rubber plug and a cork-shaped wooden wedge. When a charge is placed into a drill hole the primer is followed by the plug. The plug is expanded to the walls of the hole by the tapered wooden wedge, which is driven home with the tamping stick. This seals the charges airtight and no other stemming is necessary.



Drawing showing simplicity of new safety plug.

In case of a misfire it is said that the charge can be easily and safely handled by placing another primer against the rubber plug of the misfired charge, sealing it with another plug. The makers state that the entire charge will invariably explode, removing the danger of unexploded detonators from reaching the market. No withdrawing of the charge, reopening of the hole, or drilling of extra holes is necessary. The use of this plug is also said to result in better fragmentation than when ordinary stemming methods are used.

A Perfect Thirty-Six For 1936



10" X 36" IOWA ROLLER BEARING JAW CRUSHER

IOWA CRUSHERS ARE NOW AVAILABLE WITH SKF ROLLER BEARINGS—VISIT BOOTH B22 AT THE CLEVELAND ROAD SHOW TO SEE THESE NEW AND DIFFERENT JAW CRUSHERS

Other Products in the Cedar Rapids Line

Portable Rock & Gravel Plants.	Portable Asphalt Plants.
Roll Crushers.	Symons Vibrator Screens.
Belt Conveyors.	Quarry Plants.
Bucket Elevators.	Washing Plants.
Traveling Road Mix.	Rapidmix Plant.
Tractor-Crusher Units.	Straight Line Gravel Plants.

Catalogs Mailed Upon Request

IOWA MANUFACTURING COMPANY
CEDAR RAPIDS, IOWA

LINK-BELT VIBRATING SCREEN

ALL materials, fine or coarse, light or heavy . . . clay, gravel, sand, ores, stone, etc. . . . yield to the wizardry of the mechanically-vibrated, Link-Belt Vibrating Screen, and classify themselves in strict accordance with their size. Its uniform vibration keeps the meshes open, and makes the screen's entire screening surface 100% effective. Send for Book No. 1462.

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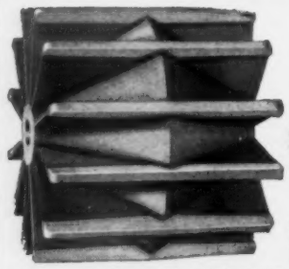
LINK-BELT COMPANY

PHILADELPHIA ATLANTA CHICAGO SAN FRANCISCO INDIANAPOLIS TORONTO

Offices in Principal Cities

SAVE YOUR CONVEYOR and Elevator Belts with SPROUT-WALDRON Wing Pulleys



Interchangeable with standard pulleys. Nothing can lodge between belt and pulley.

SPROUT, WALDRON & CO. INC.

1221 SHERMAN ST., MUNCY, PA.

Elevating, Conveying and Transmission Equipment

It's the "tops," says welders

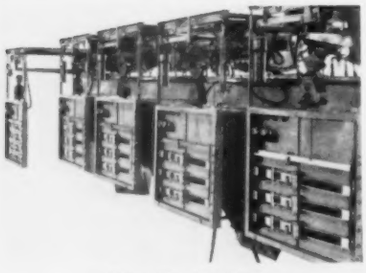
Welding operators don't have to be "sold" on this new helmet. It's their kind of helmet. Built to win their O.K. on every count. It's feather-weight—so light they hardly know it's on their head. Sturdily built, though, to take abuse. And just as compact as can be—gives protection to entire head yet doesn't feel big and bulky. The price, too, will pleasantly surprise you. Write for illustrated bulletin and prices.

THE GOGGLE PARTS COMPANY

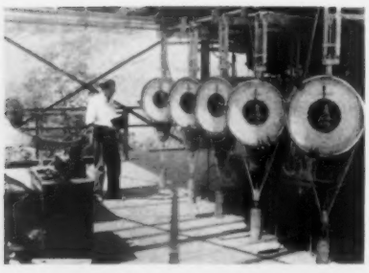
Welding Helmets • Sweatbands • Goggle Parts

414 Superior Avenue West **Cleveland, Ohio**

JOHNSON BATCHERS



Dover Dam Batchers



Norris Dam Batchers

Hetch Hetchy Dam Batchers

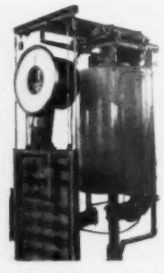
THE largest mixing plants ever built, including Johnson Bins and Batchers at Grand Coulee Dam, will mix the millions of yards of concrete required.

Two Johnson Batcher equipped miving plants poured all the 4,000,000 yards of concrete for Boulder Dam.

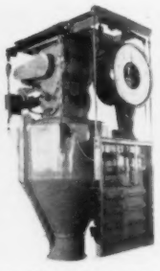
Bonneville, Hetch Hetchy, Tygart, Madden, are among the other Johnson Batcher equipped jobs.

THE C. S. JOHNSON CO.

CHAMPAIGN, ILLINOIS



Auto Weigh Water Batcher



Auto Weigh Cement Batchers

Auto Weigh Aggregate Batcher

AIDING INDUSTRIAL RECOVERY

GREEN SIGNIFIES SAFETY

• In the nation-wide effort for industrial recovery LAY-SET Preformed wire rope is playing an important part. Wherever it is necessary to have economy of operation, increased service from machinery, greater speed of production, or increased safety to workmen—there, LAY-SET is most appreciated. . . . Back in 1928 hundreds of operators found that LAY-SET Preformed handles easier, works better, lasts longer, gives greater dollar value. Since then literally thousands of operators, in every field, have learned the same thing. . . . It will pay you to investigate LAY-SET Preformed.

HAZARD WIRE ROPE COMPANY, Inc.
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GREEN SIGNIFIES SAFETY

LAY-SET *Preformed* Wire Rope

★ALL HAZARD WIRE ROPES MADE OF IMPROVED PLOW STEEL ARE IDENTIFIED BY THE GREEN STRAND

ENGINEERING SPECIALISTS

PLANT modernization is the next step toward complete industrial recovery in the cement field. It offers to every manufacturer, now operating at a loss, an opportunity to improve methods and increase profits of production.

POLYSIUS engineers are specialists in the building and rebuilding of cement plants, both the dry and the wet process types, and they provide a comprehensive service for bringing such plants to peak efficiency with the use of the least amount of new equipment.

Through the introduction of advanced methods, the replacement of obsolete machinery, and the proper coördination of manufacturing processes, POLYSIUS engineers are able to effect major economies in production, reduce fuel consumption, and raise the quality of the product.

● ● ●

Where necessary to re-equip Dry Process Plants, the use of Lepol Kilns, Polysius Pneumatic Mixing and Conveying Machinery, and the Polysius Mill which dries, grinds and separates in one operation, insures high quality production at record low cost. In addition, for Wet Process Plants, the Polysius Slurry Drier is employed with the utmost economy in results.

The outstanding successes of Polysius engineers in reconstruction work on cement plants all over the world have built an enviable reputation, and created a widespread demand for this type of service. No matter where you are located or what your problem may be, this flar-flung organization is prepared to give you prompt and efficient service.

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With the rapid revival of the building industry in all lines, you should be in a position to take advantage of the tremendous increase of business over the next few years. We welcome inquiries on your special problems.

For the U. S. and Canada . . . . . **POLYSIUS CORPORATION**
Bethlehem, Penna.

For all other Countries . . . . . **G. Polysius Aktiengesellschaft**
Dessau, Germany

● *One of six Model 99 Hug Quarry Specials operated by Tennessee Valley Authority on Norris and Wheeler Dam projects.*

The Model 99 Hug Quarry Special is available in 10 yard open end heavy duty rock body—special quarry or rectangular excavation body. Write for detailed specifications and descriptive literature.

● **This HUG Giant — the Model 99 Quarry Special is especially designed for quarry operations; capable of carrying payloads of 40,000 lbs., these Hug Giants have demonstrated their superiority on job after job where conditions made it seem almost impossible for any equipment to operate, and any equipment not built especially for the job could not operate successfully.**

The Hug Model 99 is the result of years of experience by Hug engineers in successfully building trucks to meet special conditions. Such features as the Hug special alloy steel I-beam frame, the Buda heavy duty 6 cylinder truck engine, the dual drive double reduction full floating type rear axle, 12 speeds forward, 3 speeds reverse transmission, setback wheel design with resultant equalized load distribution— all these features combined with Hug construction make possible the outstanding performance of the Model 99 Hug Quarry Special.

In addition to the famous Model 99 Quarry Special, Hug offers a complete range of chassis equipped with bodies ranging from 3 to 12 yards.

Write for detailed specifications and descriptive literature.

THE HUG COMPANY
818 CYPRESS ST., HIGHLAND, ILL.

MR. PRODUCER

Check the Facts in this letter:—

Why don't you duplicate these results in your plant?

Ask for details of No. 19 Crusher, described in this letter.

Telephone LExington 2-2387 2-2388
CABLE ADDRESS: JEKENGINE

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KENNEDY-VAN SAUN MFG. & ENG. CORPORATION
2 PARK AVENUE, NEW YORK
AT 32nd STREET
Manufacturers of
CRUSHING, MINING AND CEMENT MACHINERY
PULVERIZED COAL EQUIPMENT
PNEUMATIC TRANSPORT SYSTEMS
SCREENING, ELEVATING, CONVEYING, TRANSMISSION MACHINERY

January 1st, 1936

Subject:

Stone & Gravel Producers, Inc..
Anywhere,
U. S. A.

Gentlemen:

Is your plant equipped to produce minus 1/4" and plus 1/8" stone for top dressing, as well as 3/4", 1/2", 3/8" and 1/4" sizes? There is a great demand today for minus 1/4" and plus 1/8" material. Our little #19 gearless gyratory crusher for fine crushing will enable you to meet this demand.

A carefully conducted test was recently run on one of our #19 crushers operating on hard dolomite limestone 2½" oversize. This machine produced more than 25 tons an hour of minus 1/4" and plus 1/8" material. 20% was minus 1/8". This little #19 crusher is operated by a 25 HP motor. The actual power consumed is 21 HP. In the same plant they have one of our #25 crushers with a 25 H.P. synchronous motor built in the pulley. This machine produces 78 tons an hour when set to 7/8" on the closed side.

We have hundreds of customers who are getting equally good results. The performance described above is not unusual with our machines.

Getting double the capacity with 1/2 the power should be interesting to all people in the stone business.

If you are interested and would like to have one of our sales engineers call on you to discuss this important subject, please wire at our expense. You will be under no obligation because of his call.

Very truly yours,

KENNEDY VAN SAUN MFG. & ENG. CORP.

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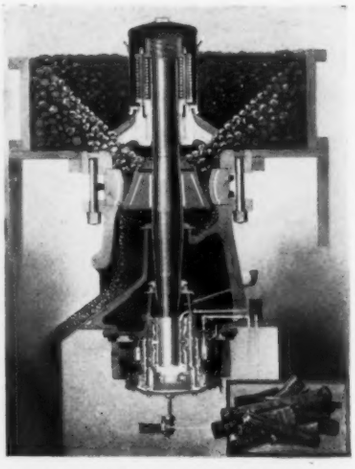
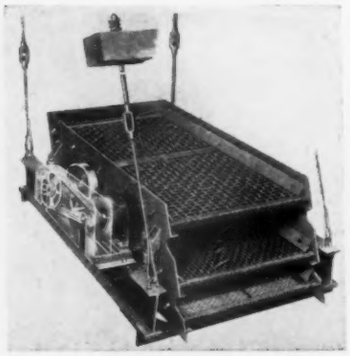
President

JEK/p



KENNEDY BALL BEARING GEARLESS GYRATORY CRUSHER

The sensational performance of this efficient unit is attracting the attention of producers everywhere. Increased tonnage with incredible savings of 50% in power consumption and 80% in maintenance costs.



KENNEDY VIBRATING SCREEN

Specially adapted for scalping oversize from primary crushers, also for grading smaller sizes. Built open or enclosed, in widths of 3′ to 6′, and with one or more decks, for suspension or bottom support.

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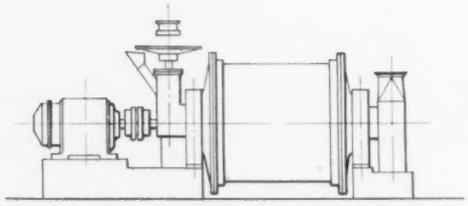
New Catalog No. 35-P-136
Sent Upon Request



KENNEDY GEARLESS TUBE MILL

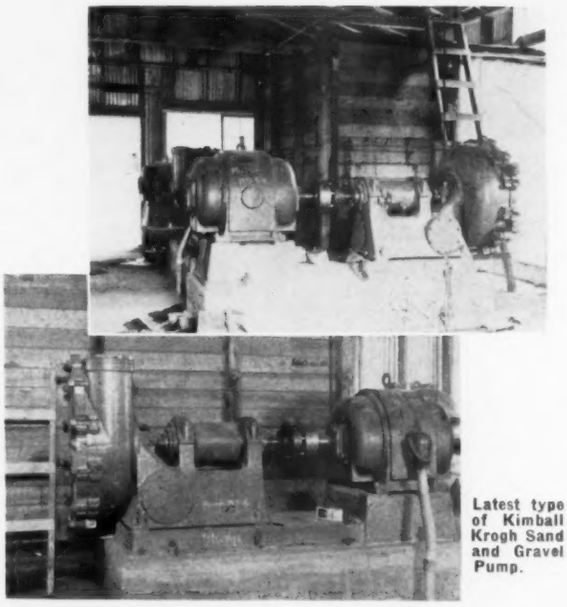
For grinding limestone, minerals and the like, and for pulverizing coal for firing kilns and boilers.

KENNEDY-VAN SAUN MFG. & ENG. CORP.
2 Park Avenue — New York, N. Y.
Sales Agents in all Principal Cities of the United States

KIMBALL KROGH PUMPS AT COULEE DAM

Screening and Sand Washing Plant at Coulee Dam. Clarifying system shown at right.

Two of the three Sludge Pumps for handling sludge from clarifiers to sand dewaterers. The third pump, a spare held in reserve, is shown below.



Latest type of Kimball Krogh Sand and Gravel Pump.

THE World's biggest sand washing and handling job is using a battery of Kimball Krogh Sludge Pumps for one of the major operations in the work at Coulee Dam.

These pumps form an important link in the system for reclaiming the water used in washing the materials, thus providing a means of salvaging the fine sizes of sand which are usually wasted in ordinary methods of operation.

Due to the heavy cost of pumping water up from the river, 600 feet below the plant level, it was necessary to install a system for clarifying the wash water for use over again.

Kimball Krogh handle the sludge from the clarifiers to the sand washers. It is estimated that a maximum of 300 tons per hour is handled by a pair of pumps with sludge at 50% concentration.

Whenever the deciding factors are high capacity, low maintenance and uninterrupted operation, Kimball Krogh Pumps are always the logical choice of equipment where conditions are unusually severe.

VICTOR EQUIPMENT COMPANY

KIMBALL KROGH PUMP DIVISION

1010 E. 62nd Street
Los Angeles

515 Harrison St.
San Francisco

Victor Equipment Company, 1010 E. 62nd St., Los Angeles, Cal.

We are interested in securing further information in regard to your new Sand and Gravel Pumps.

NAME ..... ADDRESS .....

ARC-LOC—DOUBLE CRIMP—WOVEN SLOT—WELDED SLOT—ROLLED RECTANGULAR OPENING

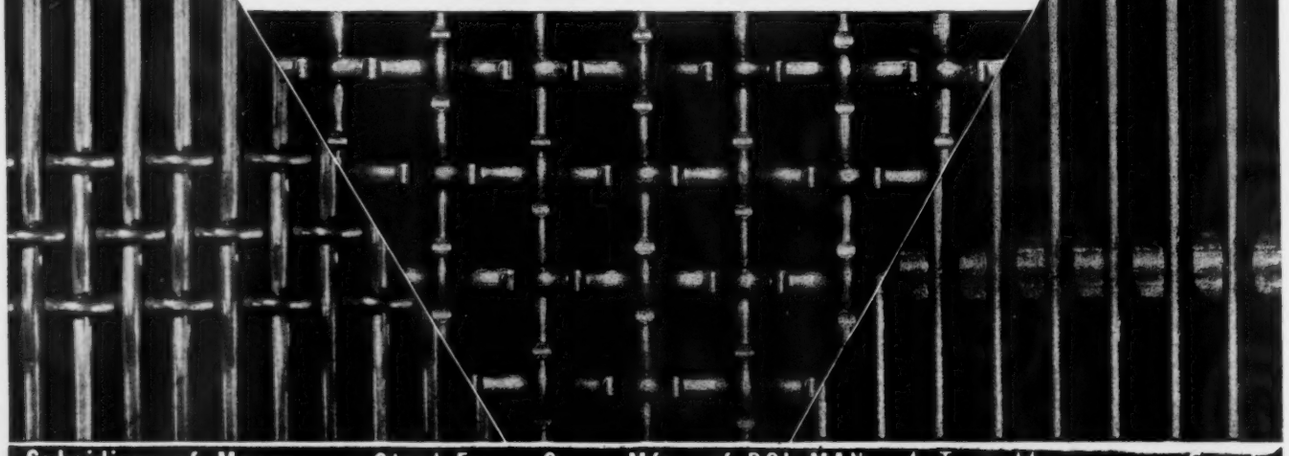
VIBRALOY SCREENS

Alloyed for the Aggregate Industries . . . "Special" quality at a "standard" price . . . Unexcelled on a cost per ton basis for accurate screening of sand, rock, ore, coke, etc. . . . Hard, springy and tough for stamina under wet, scouring abrasion and heavy, fast-moving loads. . . Send for new complete 56 page catalog No. 40-3.

AUDUBON WIRE CLOTH CORPORATION

Subsidiary of Manganese Steel Forge Co., Mfrs. of Rol-Man Screens

Castor Ave. & Allen St., PHILADELPHIA, PA.



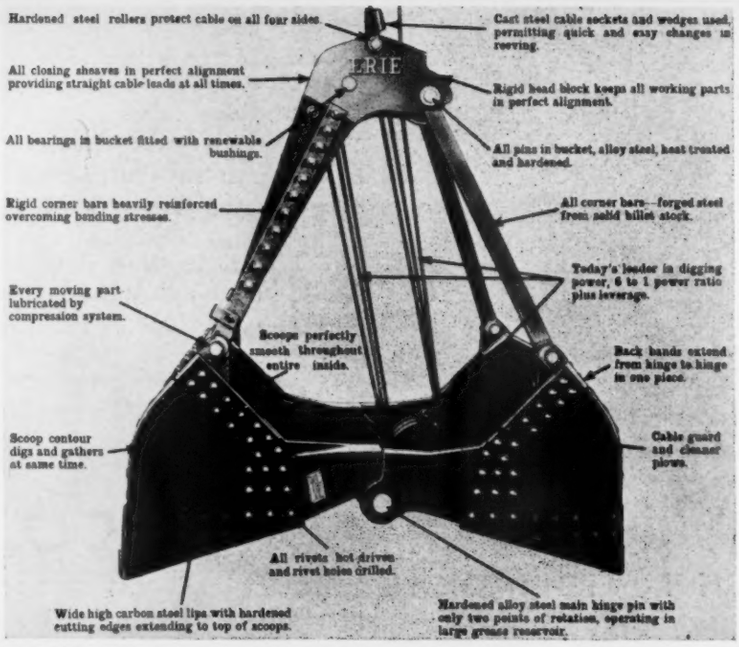
Subsidiary of Manganese Steel Forge Co., — Mfrs. of ROL-MAN — *A True Manganese Steel*

Today's LEADER *in Low Headroom in Digging Power*

Here is the "newcomer" to the Erie Line which closely follows the "Multi-Power" traditions as far as basic features are concerned and includes the last word in efficiency and low maintenance cost resulting from careful study made by engineers who have had years of experience in the art of clamshell operations.

It has proven its right to leadership under the most rigid specifications of careful buyers and its stamina has won a most enviable reputation for long, dependable service.

It is an all-steel unit built in a sturdy, durable manner guaranteed as a whole as well as the respective parts for a period of one (1) year against defects in material, workmanship and design.


Hardened steel rollers protect cable on all four sides.
Cast steel cable sockets and wedges used, permitting quick and easy changes in reeving.
All closing sheaves in perfect alignment providing straight cable leads at all times.
ERIE
Rigid head block keeps all working parts in perfect alignment.
All bearings in bucket fitted with renewable bushings.
All pins in bucket, alloy steel, heat treated and hardened.
Rigid corner bars heavily reinforced overcoming bending stresses.
All corner bars—forged steel from solid billet stock.
Today's leader in digging power, 6 to 1 power ratio plus leverage.
Every moving part lubricated by compression system.
Scoops perfectly smooth throughout entire inside.
Back bands extend from hinge to hinge in one piece.
Scoop contour digs and gathers at same time.
Cable guard and cleaner plows.
All rivets hot driven and rivet holes drilled.
Wide high carbon steel lips with hardened cutting edges extending to top of scoops.
Hardened alloy steel main hinge pin with only two points of rotation, operating in large grease reservoir.

Whether your requirements are standard or special we are the one bucket manufacturer building a complete line from which you can select a bucket for every need from our various designs of:—

- Digging Clamshell Buckets
- Rehandling Clamshell Buckets
- General Purpose Clamshell Buckets
- Motor-Operated Clamshell Buckets
- Dragline Buckets
- Multiple Prong Grabs

We carry a complete stock of all standard sizes and modification to the standard designs can also be made to correspond with unusual methods of operation or to better fit the bucket to a specific type of crane.

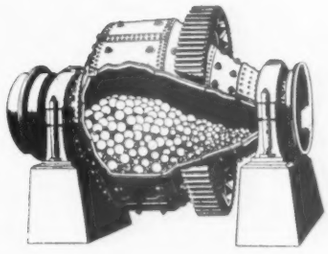
WE ARE READY TO ASSIST YOU IN ALL PROBLEMS OF BUCKET APPLICATION

BUCKETS, ELECTRIC TRAVELING OVERHEAD CRANES, AGGREMETERS

ERIE STEEL CONSTRUCTION CO., ERIE, PA.

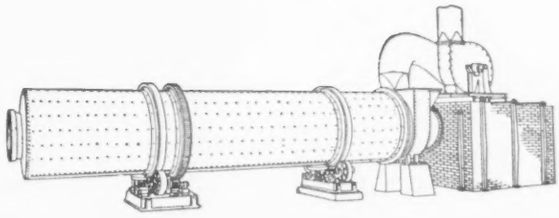
HARDINGE

Pulverizing and Grinding Mills



The Hardinge Conical Mill is the most widely used and most universal of all pulverizers. For wet grinding or dry grinding, to secure a granular product, or extremely fine product, this mill has the lowest maintenance record of any type of pulverizer in commercial use—bar none.—Bulletin 13-C.

Ruggles-Coles Dryers

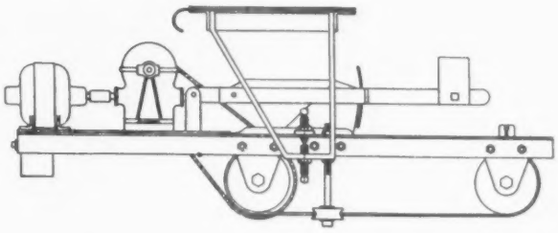


Double shell types for products requiring close control of heat and low fuel consumption.

Single shell types where first cost is more important than the ultimate in efficiency.

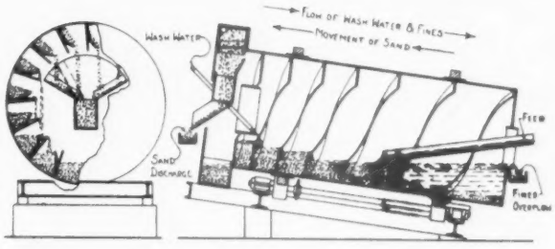
More Ruggles-Coles Dryers are used than Dryers of any other make.—Bulletin 16-B.

Constant Weight Feeders



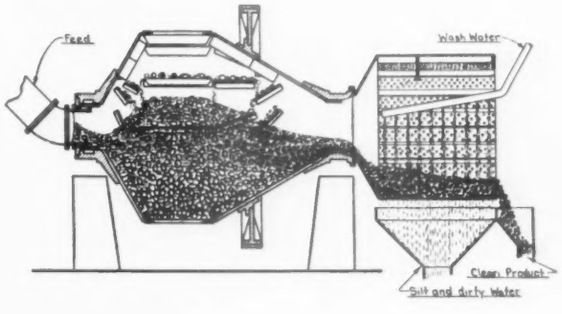
The only feeder that actually increases process capacity 5% to 15% by controlling the flow at a constant weight (not volume). A truly revolutionary piece of equipment—simple and low in cost. It also records the weight fed.—Bull. 33-C.

Washer Classifiers



For washing, separating, cleaning, desilting, classifying. No moving parts except the slowly revolving drum. Contamination eliminated and separating efficiency far beyond the ordinary. Capacities range from laboratory size to anything you want.—Bulletin 39.

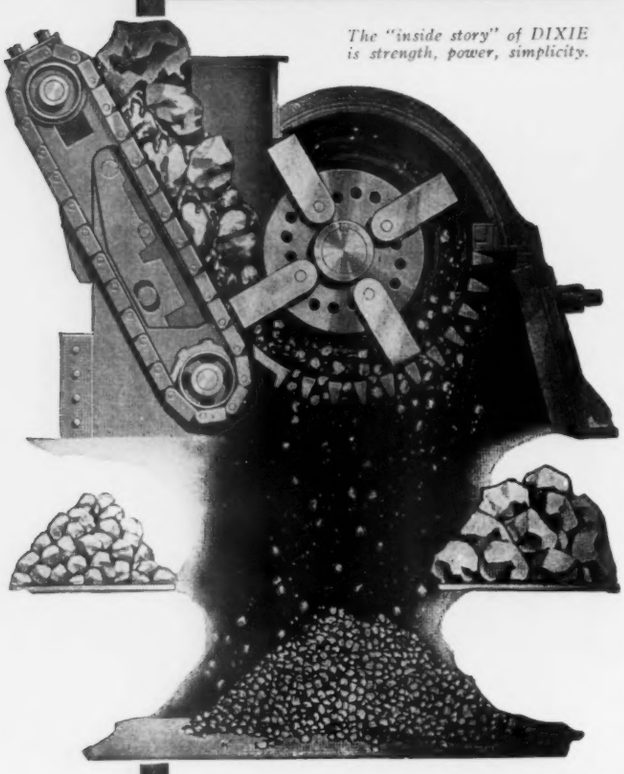
Scrubbers



The only scrubber for stone, gravel, sand that scrubs by mass action. No internal moving parts. Water requirement is one quarter that ordinarily required. Particularly suitable for that tough job where clay balls are present.—Bulletin 37.

See our exhibit at the Sand and Gravel Convention, St. Louis, Missouri, in January

HARDINGE COMPANY
INCORPORATED
York, Pa.—Main Office and Works **Chicago**—205 W. Wacker Drive
New York—122 E. 42nd St. **San Francisco**—444 Market St.



The "inside story" of DIXIE is strength, power, simplicity.

Irresistible!

HERE'S plenty of crushing power for the toughest material. Note the massive construction of the DIXIE MOGUL Non-Clog Hammermill—the special moving breaker plate is 26 times the average wearing area—husky hammers of manganese steel—oversize shaft, and every part made extra strong where the terrific strains come.

With the DIXIE MOGUL on the job, you can be sure of profitable operation, free of delays from clogging or shut-downs. You need this high capacity, low-cost crusher on public works projects where non-stop service is vital. Built in forty sizes for primary, secondary or fine reduction.

Write for your copy of this 32-page Catalog on modern crushing methods. It points the way to big savings.

DIXIE

MACHINERY MFG. CO.

4209 Goodfellow Ave., ST. LOUIS, MO

New!

More Capacity!

Lower Costs!

Positive Uniformity!

Greater Efficiency!

The capacity of grinding mills is materially increased by this new Gayco Centrifugal Air Separator. Fines are removed as they are made.

It delivers an absolutely uniform product of any fineness desired from 60 to 400 mesh with greater capacity and lower power cost than is possible with any other type of air separator.

It is slow speed, requiring very little power. Repair costs are practically nothing—the only wearing parts are the steel cut gears and bearings enclosed in a dust proof casing.

Send for further details—

RUBERT M. GAY

Division, Universal Road Machinery Company

114 Liberty St. New York, N. Y.

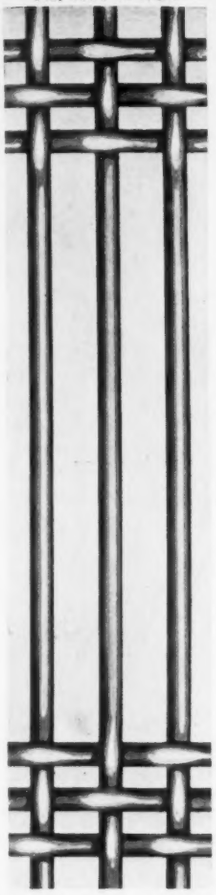
Crushing, Screening, Washing

equipment—Reliance—in capacities from 50 to 1500 tons per day. Built with simplicity of design for long hard service with low maintenance costs. Send for catalog and full information.

Universal Road Machinery Co.

Kingston, N. Y.

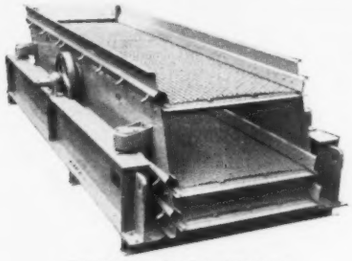
No. 9381 TY-ROD



U. S. Patent No. 2024806

TYLER SCREENS and SCREEN CLOTH

ALL MESHES — ALL METALS
SPECIAL HIGH-CAPACITY WEAVES



TYLER-NIAGARA SCREEN

Circle-Throw Mechanically Vibrated Screens,
Electrically Vibrated Screens
Ro-Tap and Ty-Lab Testing Sieve Shakers
Tyler Sieves, Scrubber, Dryers

The W. S. TYLER COMPANY
3623 Superior Avenue
CLEVELAND, OHIO

Any Job—Anywhere

can be reached quickly and serviced economically with the

CONCRETE TRANSPORT MIXER

High-grade all-steel Mixer with double action helical blades, operated by roller bearing take-off with variable speeds up to 20 RPM. Both rear and side discharge to suit all jobs and conditions. Send for descriptive folder today, and let us tell you what contractors and operators say about performance, low initial and operating cost.

CONCRETE TRANSPORT MIXER COMPANY
650 Rosedale Ave. St. Louis, Missouri

Installation at Hornell Gravel Corpn., Hornell, N. Y.

New Jobs—More Profits

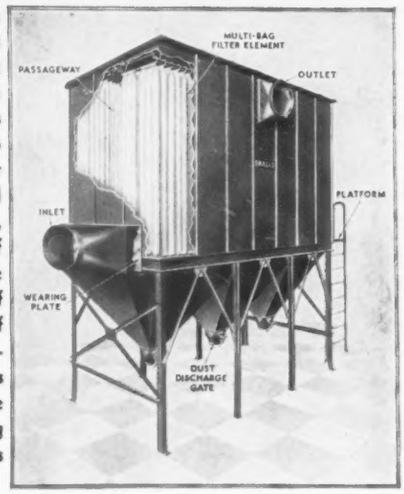
Here's an equipment that will enable you to meet specifications that are fussy about shale, ochre, sandstone, sailers, lignite and such things. It does the job thoroughly, economically—opens up new jobs, new profits. Write for full details.

THE KNICKERBOCKER COMPANY
603 Liberty St. **Jackson, Michigan**

KNICKERBOCKER Soft Stone Eliminator

DRACCO DUST CONTROL pays LARGE dividends

Where there is DUST there is needless expense that can be eliminated with DRACCO MULTI-BAG FILTERS. This unit was especially designed to meet the needs of your field. Dust Control will pay you from 4 angles, (1) increased efficiency of operation; (2) longer life and less maintenance of equipment; (3) health of workers; (4) fewer lawsuits. DRACCO Filters are economical,—have low initial and operating costs and maintenance is reduced to a minimum.



WE CAN SAVE YOU MONEY

Dracco Engineers have many years of Dust Control experience that will prove invaluable in solving your Dust problems. If there is Dust in your plant, we should like to hear from you and give you the benefit of our experience. DRACCO DUST CONTROL PAYS LARGE DIVIDENDS.

DRACCO CORPORATION
Successors to The Dust Recovering & Conveying Co.
4077 E. 116 St. **Cleveland, Ohio**

WRITE FOR BULLETIN NO. 301

12 SYMONS Double-Deck Are Major Equipment World's Most Modern Aggre

BUILT FOR CONTINUOUS NIGHT AND DAY PRODUCTION

WHEN you have to prepare about 8,000,000 cu. yds. of aggregate to meet a U. S. Bureau of Reclamation high quality concrete specification,

And WHEN 55% of your pit run is excess sand,

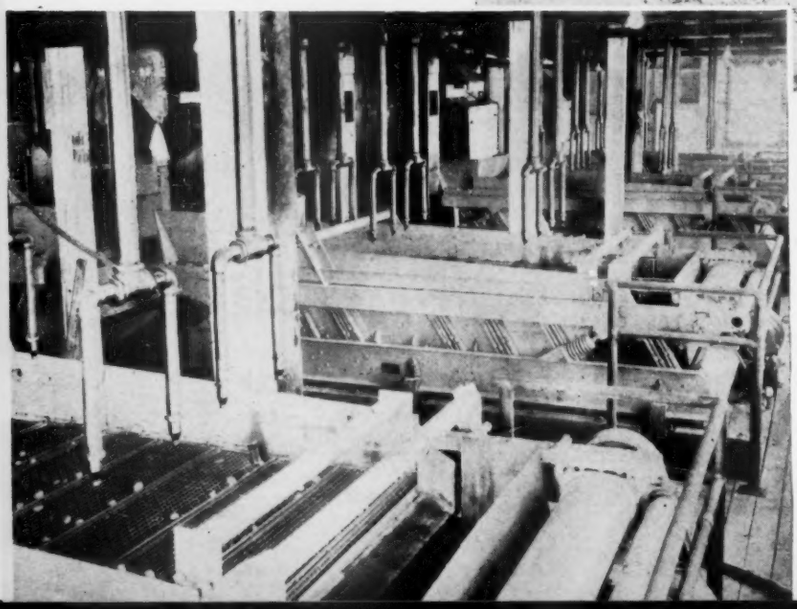
And WHEN you have millions of dollars invested in a concrete mixing plant tuned up to pour 12,000 cu. yds. per day,

THEN screening becomes a problem of major importance.

By an ingenious selection and arrangement of the most modern and efficient screening, washing and material handling devices, M-W-A-K Company, General Contractors on Grand Coulee Dam, has solved this problem with an aggregate plant in which twelve 5'x10' Symons double-deck Vibrating Screens are major equipment.

(1) The four different sizes of aggregate sorted out by the Symons Vibrating Screens are taken, each by individual conveyor belts, to these four live stock piles which are directly over the tunnel through which runs the main conveyor belt to the storage yard, more than a mile away. Note the "stone ladders" by which the aggregate is permitted to "slide" down gently to the storage piles, thus reducing danger of additional fracture and a resultant excess of fines.

(2) Below: A view inside the main screen house, showing part of the battery of eight Symons Screens on Floor 2. Water from spray nozzles above each screen saturate the gravel, thoroughly washing it as the vibrators speed it on its proper course.



SYMONS

MANUFACTURED

SYMONS BROS. DEVELOPMENT CO.
1462 No. Stanley Avenue
Hollywood, California

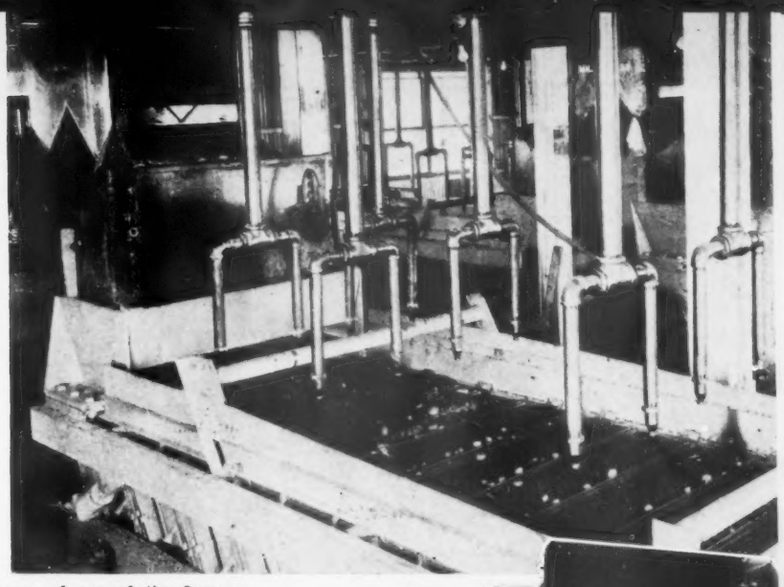
HOWARD-COOPER CORPORATION
307 S. E. Hawthorne Blvd.
Portland, Oregon

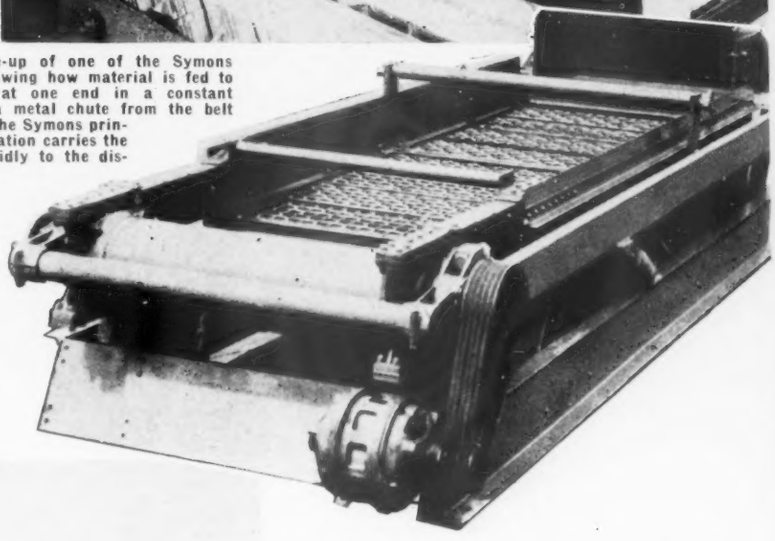
SCREENS in this gate Plant!

A four story building is required to house the main screening and washing process in M-W-A-K Company's million-dollar aggregate plant. On the third floor of this building is a battery of four Symons Vibrating Screens. Onto these screens, by big conveyor belts from the balance stock pile, pours the avalanche of rock and gravel that will go into the largest concrete dam in the world. The top deck screen sorts out the 3" to 6" material, the bottom deck segregates the 1½" to 3" material. A deluge of water speeds the process, washing the aggregate clean as it goes.

On the second floor, a battery of eight Symons Screens receives the "fines" and the ¾" to 1½" and the 3/16" to ¾" particles are sorted out and conveyed to their respective stock piles. Day and night this must go on, for two years on the present contract (for 6 or 8 years to complete the high dam).

The selection of Symons Vibrating Screens is significant testimony to their capacity and dependability.

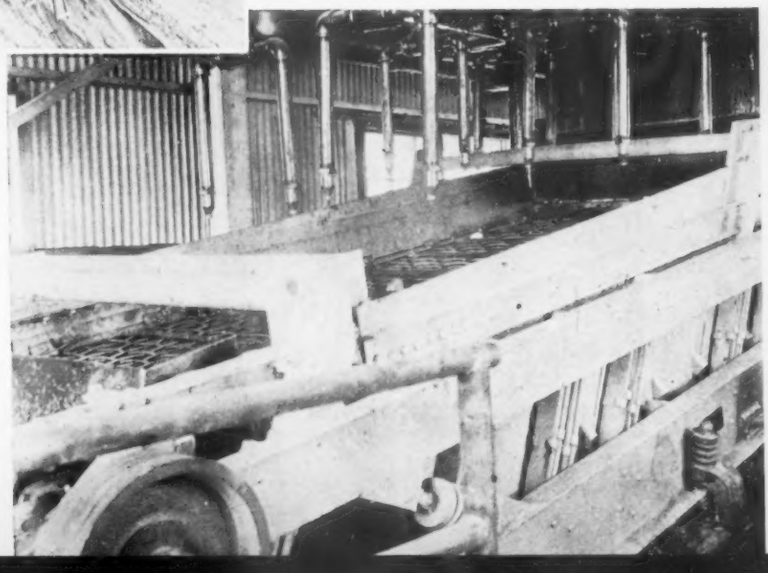




(3) A close-up of one of the Symons Screens, showing how material is fed to the screen at one end in a constant stream by a metal chute from the belt conveyor. The Symons principle of vibration carries the oversize rapidly to the discharge end.

DETAIL CUT of a SYMONS VIBRATING SCREEN —Built in a number of Standard and Special sizes to meet difficult screening requirements. Special designs for Portable Plants.

(5) Below: A close-up of one of the battery of four Symons Screens on Floor 3 of the M-W-A-K Company plant at Grand Coulee. Sturdy construction combined with simplicity of design explain why these screens can be trusted to stand up under the gruelling test of 8,000,000 cu. yds. of aggregate screening.



SCREENS

AND SOLD BY

NORDBERG MANUFACTURING CO.
Milwaukee, Wis.

IOWA MANUFACTURING CO.
Cedar Rapids, Iowa
For Their Portable Rock and Paving Plants

Classified Buyers' Guide

A Directory of PIT AND QUARRY Advertisers Arranged According to Product

Although every effort is made to insure accuracy and completeness in these listings, the publisher cannot accept responsibility for errors or omissions. Any mistakes discovered will gladly be rectified, if brought to the attention of the Advertisers' Service Department.

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Ryerson & Son, Joseph T.

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Hetherington & Berner, Inc.

Aggremeter Plants
*Blaw-Knox Co.
Erie Steel Construction Co.
Johnson Co., C. S.

Agitating Ladders (Dredge)
*Eagle Iron Works

Agitators, Thickeners and Slurry Mixers
*Hardinge Co.
*Smidth & Co., F. L.
*Traylor Engr. & Mfg. Co.

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Chicago Pneumatic Tool Co.
*Curtis Pneumatic Machy. Co.
*Sullivan Machy. Co.
*Traylor Engr. & Mfg. Co.

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Chicago Pneumatic Tool Co.
*Curtis Pneumatic Machy. Co.
*Sullivan Machy. Co.
*Traylor Engr. & Mfg. Co.

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*Blaw-Knox Co.
Dracco Corp.
*Western Precipitation Co.

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*Hardinge Co.
Polysuis Corp.
Raymond Bros. Impact Pulv. Co.
Universal Road Machy. Co.
*Williams Patent Crusher & Pulverizer Co.

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*Link Belt Co.
*Robins Conveying Belt Co.
Stephens-Adamson Mfg. Co.

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*Bartlett & Snow Co., C. O.
*Hardinge Co.
*Jeffrey Mfg. Co.
*Link Belt Co.
Schaffer Poidometer Co.
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*Blaw-Knox Co.
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*Austin-Western Road Machy. Co.
*Harnischfeger Corp.
*Lima Locomotive Works, Inc.

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Manganese Steel Forge Co.

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Manganese Steel Forge Co.
Smidth & Co., F. L.

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Hetherington & Berner, Inc.
*Link-Belt Co.
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Haiss Mfg. Co., Geo.
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Republic Rubber Co.

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Goodyear Tire & Rubber Co.
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Bin Gates
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Bins (Steel)
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*Hendrick Mfg. Co.
Hetherington & Berner, Inc.
Iowa Mfg. Co.
*Jeffrey Mfg. Co.
Johnson Co., C. S.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Link-Belt Co.
Manganese Steel Forge Co.
McLanahan and Stone Corp.
*Pioneer Gravel Equipment Mfg. Co.
*Robins Conveying Belt Co.
Sprout, Waldron & Co.
Stephens-Adamson Mfg. Co.

Blast-Hole Drills (See Drills—Blast-Hole)

Blasting Plugs
Heitzman Safety Blasting Plug Co.

Blasting Supplies
*Ensign-Bickford Co.
Heitzman Safety Blasting Plug Co.

Blocks (Sheave)
*American Hoist & Derrick Co.
American Manganese Steel Co.
Haiss Mfg. Co., Geo.
*Sauerman Bros., Inc.
Sprout, Waldron & Co.

Bodies (Motor Truck)
Hug Co.

Bodies (Motor Truck, Concrete Mixing)
*Bartlett & Snow Co., C. O.
*Blaw-Knox Co.

Boots (Rubber)
Goodyear Tire & Rubber Co.
Jaeger Machine Co.

Borings, Core
Mott Core Drilling Co.
Pennsylvania Drilling Co.

Bronze Work (Ornamental)
National Wire Cloth Co.
*Tyler Co., W. S.

Bucket Elevators (See Conveyors and Elevators)

Buckets (Clamshell, Orange-Peel, Etc.)
*American Hoist & Derrick Co.
American Manganese Steel Co.
*Bartlett & Snow Co., C. O.
*Blaw-Knox Co.
Erie Steel Construction Co.
Haiss Mfg. Co., Geo.
*Harnischfeger Corp.
Industrial Brownhoist Corp.
*Link-Belt Co.
Wellman Engr. Co.

Buckets (Dragline—Cableway)
*Bartlett & Snow Co., C. O.
Erie Steel Construction Co.
*Link-Belt Co.
*Pioneer Gravel Equipment Mfg. Co.
*Sauerman Bros., Inc.
Wellman Engr. Co.

Buckets (Electric)
Erie Steel Construction Co.

Buckets (Elevator and Conveyor)
*Bartlett & Snow Co., C. O.
Cross Engr. Co.
Haiss Mfg. Co., Geo.
*Hendrick Mfg. Co.
Industrial Brownhoist Corp.
Iowa Mfg. Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.
Manganese Steel Forge Co.
McLanahan and Stone Corp.
*Pioneer Gravel Equipment Mfg. Co.
*Robins Conveying Belt Co.
Smith Engr. Works
Sprout, Waldron & Co.
Stephens-Adamson Mfg. Co.

Buggies (Dump)
Koehring Co.
Le Tourneau, Inc., R. G.

Bulk-Cement Storage Plants
Sprout, Waldron & Co.

Bulldozers
Le Tourneau, Inc., R. G.

Cableways
*Link-Belt Co.
*Roebling's Sons Co., John A.
*Sauerman Bros., Inc.

Calcium Chloride
Calcium Chloride Assn.

Capstans (See Winches and Capstans)

Car Dumpers
*Link-Belt Co.
Wellman Engr. Co.

Car Pullers
*Bartlett & Snow Co., C. O.
*Jeffrey Mfg. Co.
*Link-Belt Co.
Stephens-Adamson Mfg. Co.

Carriers
*Bartlett & Snow Co., C. O.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.
Smith Engr. Works
Sprout, Waldron & Co.

Carryalls
Le Tourneau, Inc., R. G.

Cars (Quarry and Gravel Pit)
*Austin-Western Road Machy. Co.
Stephens-Adamson Mfg. Co.

Car Wheels — (See Wheels — Car)

Castings
American Manganese Steel Co.
*Bartlett & Snow Co., C. O.
*Eagle Iron Works
*Hardinge Co.
Hetherington & Berner, Inc.
Iowa Mfg. Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Link-Belt Co.
McLanahan and Stone Corp.
*Robins Conveying Belt Co.
Sprout, Waldron & Co.
Stephens-Adamson Mfg. Co.

Cement Pumps (See Pumps; Air Pumps; Pumps, Cement Slurry; Pumps, Bulk Cement)

Central Concrete-Mixing Plants (Complete)
*Bartlett & Snow Co., C. O.
Sprout, Waldron & Co.
Stephens-Adamson Mfg. Co.

Chain (Dredge and Shovel)
Manganese Steel Forge Co.
Ryerson & Son, Joseph T.

Chain Drives
*Link-Belt Co.
Stephens-Adamson Mfg. Co.

Chain (Elevating and Conveying)
American Manganese Steel Co.
*Bartlett & Snow Co., C. O.
Cross Engr. Co.
Haiss Mfg. Co., Geo.
*Jeffrey Mfg. Co.
*Link-Belt Co.
Manganese Steel Forge Co.
Sprout, Waldron & Co.
Stephens-Adamson Mfg. Co.

Chutes and Chute Liners
American Manganese Steel Co.
Bartlett & Snow Co., C. O.
Cross Engr. Co.
Goodyear Tire & Rubber Co.
Haiss Mfg. Co., Geo.
*Hendrick Mfg. Co.
Iowa Mfg. Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.
McLanahan and Stone Corp.
*Robins Conveying Belt Co.
*Smidth & Co., F. L.
Sprout, Waldron & Co.
Stephens-Adamson Mfg. Co.

Classifiers
*Deister Machine Co.
*Hardinge Co.
Iowa Mfg. Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Knickerbocker Co.
Lewistown Foundry & Machine Co.
*Link-Belt Co.
Simplicity Engr. Co.
Stephens-Adamson Mfg. Co.

Clips (Wire Rope)
American Hoist & Derrick Co.
*Roebling's Sons Co., John A.

Clutches
*Jeffrey Mfg. Co.
*Link-Belt Co.
Sprout, Waldron & Co.

Coal-Pulverizing Equipment
*Allis-Chalmers Mfg. Co.
*Bartlett & Snow Co., C. O.
Bonnot Co.
Gay, Rubert M.
*Hardinge Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Raymond Bros. Impact Pulv. Co.
*Smidth & Co., F. L.
Universal Road Machy. Co.
*Williams Patent Crusher & Pulverizer Co.

Compressors (See Air Compressors)

Concentrators (Slurry)
*Deister Concentrator Co.

Concrete Breakers
Chicago Pneumatic Tool Co.
*Sullivan Machy. Co.

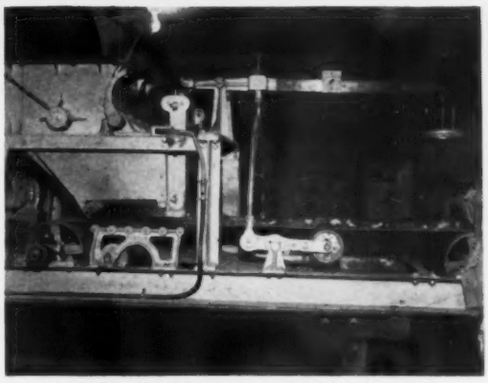
Concrete Mixers
Jaeger Machine Co.
Koehring Co.

Concrete Slab-Raising Equipment (Mud-Jacks)
Koehring Co.

Condensors
Chicago Pneumatic Tool Co.

Cones (Sand-Washing)
*Bartlett & Snow Co., C. O.
Iowa Mfg. Co.
*Link-Belt Co.
Smith Engr. Works

*** See also information in the 1935 Pit and Quarry HANDBOOK.**



New Schaffer Poidometer over B. & W. Finish Grinding Mill at Spokane Portland Cement Co.

Another Poidometer for Spokane Portland Cement Co.

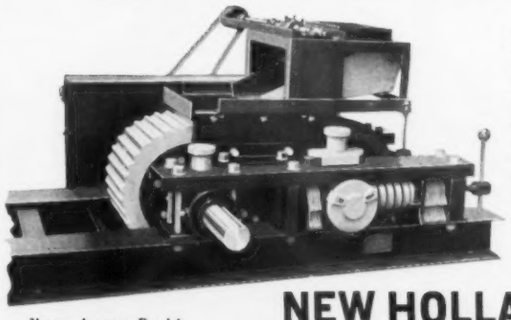
The Spokane Portland Cement Co. have used Poidometers for years. Now—in their newly remodeled modernized plant they have installed another Poidometer to serve the new Babcock and Wilcox finish grinding mill. You too can obtain accurate control in your plant.

Write for Descriptive Catalogue No. 20

Schaffer Poidometer Co.

2828 Smallman St., Pittsburgh, Pa.

For Speedy Production New HOLLAND Crushers and Screens



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Low priced, high quality Crushers that do a big day's work in a hurry —Tough long-wearing Screens that make difficult screening easy, and made in one, two and three-deck types, with sturdy vibrating mechanism for insuring rapid, uniform sizing. Write for BULLETIN of this economical equipment.

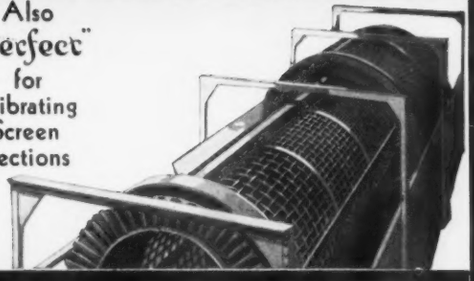
Heavy-duty Vibrating Screen—a size for every purpose.

NEW HOLLAND MACHINE Co.

P. O. Box No. 200 **New Holland, Penna.**

The "Perfect" SUPER-LOY WOVEN WIRE SCREENS

Also "Perfect" for Vibrating Screen Sections

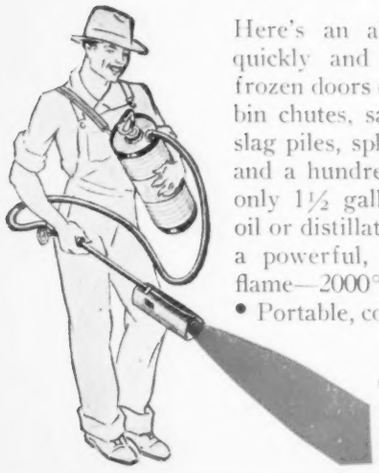


Ask for SUPER-LOY Bulletin No. 48-E

LUDLOW-SAYLOR WIRE CO. ST. LOUIS

THAW OUT YOUR FROZEN CARS . . . .

with the AEROIL No. 99 THAWING TORCH



Here's an all-purpose torch that quickly and efficiently thaws out frozen doors on cars, machine parts, bin chutes, sand, gravel, stone and slag piles, splits rocks and boulders and a hundred other jobs • Burns only 1½ gallons of kerosene, fuel oil or distillate per hour • Produces a powerful, windproof, smokeless flame—2000° F., 30″ long, 3″ wide. • Portable, compact, easy to operate.

• Every No. 99 Torch is unconditionally guaranteed for one year. Costs only $20.00 complete. Write for Bulletin 102A and FREE TRIAL OFFER.

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178 N. Wacker Drive CHICAGO — WEST NEW YORK NEW JERSEY — 469 BRYANT ST. SAN FRANCISCO

Classified Buyers' Guide

A Directory of PIT AND QUARRY Advertisers Arranged According to Product

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Conveyor Belting (See Belting)

Conveyor Idlers and Rolls
*Bartlett & Snow Co., C. O.
Haiss Mfg. Co., Geo.
Iowa Mfg. Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.
Sprout, Waldron & Co.
Stephens-Adamson Mfg. Co.

Conveyors and Elevators
*Allen-Sherman-Hoff Co.
*Allis-Chalmers Mfg. Co.
Bacon, Inc., Earle C.
*Bartlett & Snow Co., C. O.
Cross Engr. Co.
Dracco Corp.
Good Roads Machy. Corp.
*Gruendler Crusher & Pulverizer Co.
Haiss Mfg. Co., Geo.
*Hendrick Mfg. Co.
Industrial Brownhoist Corp.
Iowa Mfg. Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Machinery Co.
*Link-Belt Co.
McLanahan and Stone Corp.
New Holland Machine Co.
*Pioneer Gravel Equipment Mfg. Co.
*Robins Conveying Belt Co.
Smith Engr. Works
Sprout, Waldron & Co.
Stephens-Adamson Mfg. Co.
*Traylor Engr. & Mfg. Co.
Universal Road Machy. Co.

Conveyors (Pneumatic)
Dracco Corp.
Polysius Corp.

Conveyors (Ready-Mixed Concrete)
*Bartlett & Snow Co., C. O.
*Blaw-Knox Co.
Haiss Mfg. Co., Geo.
Jaeger Machine Co.
*Link-Belt Co.
*Robins Conveying Belt Co.

Coolers (Clinker)
*Smidth & Co., F. L.

Coolers (See Kilns and Coolers—Rotary)

Correcting Basins
*Smidth & Co., F. L.

Couplings (Flexible and Shaft)
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.
Sprout, Waldron & Co.
Stephens-Adamson Mfg. Co.

Couplings (Hose)
Chicago Pneumatic Tool Co.

Cranes (Crawler and Locomotive)
*American Hoist & Derrick Co.
*Austin-Western Road Machy. Co.
*Bay City Shovels, Inc.
*Harnischfeger Corp.
Industrial Brownhoist Corp.
Koehring Co.
*Lima Locomotive Works, Inc.
*Link-Belt Co.
Michigan Power Shovel Co.
Osgood Co.
Thew Shovel Co.
Universal Crane Co.

Cranes (Overhead)
*Curtis Pneumatic Machy. Co.
Erie Steel Construction Co.
*Harnischfeger Corp.
Industrial Brownhoist Corp.

Crusher Parts
American Manganese Steel Co.
*American Pulverizer Co.
*Bartlett & Snow Co., C. O.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
McLanahan and Stone Corp.

Crushers (Cone)
Nordberg Mfg. Co.

Crushers (Hammer)
*Allis-Chalmers Mfg. Co.
*American Pulverizer Co.
*Austin-Western Road Machy. Co.
*Bartlett & Snow Co., C. O.
Bonnot Co.
*Dixie Machy. Mfg. Co.
Good Roads Machy. Corp.
*Gruendler Crusher & Pulverizer Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng Corp
*Williams Patent Crusher & Pulverizer Co.

Crushers (Jaw and Gyratory)
*Allis-Chalmers Mfg. Co.
*Austin-Western Road Machy. Co.
Bacon, Inc., Earle C.
*Bartlett & Snow Co., C. O.
Good Roads Machy. Corp.
*Gruendler Crusher & Pulverizer Co.
Iowa Mfg. Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Machinery Co.
New Holland Machine Co.
Nordberg Mfg. Co.
*Pioneer Gravel Equipment Mfg. Co.
Smith Engr. Works
*Traylor Engr. & Mfg. Co.
Universal Road Machy. Co.

Crushers (Ring)
*American Pulverizer Co.
*Bartlett & Snow Co., C. O.
*Williams Patent Crusher & Pulverizer Co.

Crushers (Roll)
*Allis-Chalmers Mfg. Co.
*American Pulverizer Co.
*Austin-Western Road Machy. Co.
*Bartlett & Snow Co., C. O.
Bonnot Co.
*Gruendler Crusher & Pulverizer Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Link-Belt Co.
McLanahan and Stone Corp.
New Holland Machine Co.
*Pioneer Gravel Equipment Mfg. Co.
*Robins Conveying Belt Co.
*Williams Patent Crusher & Pulverizer Co.

Crushers (Rotary)
*Allis-Chalmers Mfg. Co.
*American Pulverizer Co.
*Austin-Western Road Machy. Co.
*Bartlett & Snow Co., C. O.
Bonnot Co.
New Holland Machine Co.
*Williams Patent Crusher & Pulverizer Co.

Crushing Rolls
*Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
*Austin-Western Road Machy. Co.
*Bartlett & Snow Co., C. O.
Bonnot Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Link-Belt Co.
McLanahan and Stone Corp.
New Holland Machine Co.
*Traylor Engr. & Mfg. Co.
*Williams Patent Crusher & Pulverizer Co.

Derricks and Derrick Fittings
*American Hoist & Derrick Co.

Diesel Engines (See Engines—Diesel)

Dipper Parts
American Manganese Steel Co.

Dippers and Teeth (Power Shovel)
American Manganese Steel Co.
Koehring Co.

Dragline Cableway Excavators
*American Hoist & Derrick Co.
Good Roads Machy. Corp.
*Link-Belt Co.
*Sauerman Bros., Inc.

Dragline Excavators
*American Hoist & Derrick Co.
*Austin-Western Road Machy. Co.
*Bay City Shovels, Inc.
*Harnischfeger Corp.
Industrial Brownhoist Corp.
Koehring Co.
*Lima Locomotive Works, Inc.
*Link-Belt Co.
Michigan Power Shovel Co.
Osgood Co.
Thew Shovel Co.
Universal Crane Co.

Dredges
*American Hoist & Derrick Co.
Hetherington & Berner, Inc.
*Morris Machine Works

Drilling Accessories
Chicago Pneumatic Tool Co.
*Sullivan Machy. Co.

Drilling Contractors
Hoffman Bros. Drilling Co.
Mott Core Drilling Co.
Pennsylvania Drilling Co.

Drills (Blast-Hole)
Chicago Pneumatic Tool Co.
*Sullivan Machy. Co.

Drills (Core)
Hoffman Bros. Drilling Co.
Mott Core Drilling Co.
Pennsylvania Drilling Co.
*Sullivan Machy. Co.

Drills (Diamond)
Chicago Pneumatic Tool Co.
Hoffman Bros. Drilling Co.
Mott Core Drilling Co.
Pennsylvania Drilling Co.
*Sullivan Machy. Co.

Drills (Hand-Hammer)
Chicago Pneumatic Tool Co.
*Sullivan Machy. Co.

Drills (Rock)
Chicago Pneumatic Tool Co.
*Jeffrey Mfg. Co.
*Sullivan Machy. Co.

Drill Steel
Chicago Pneumatic Tool Co.

Drills (Well) (See Drills—Blast-Hole)

Drives (Multiple, Belt, Chain, Rope)
*Allis-Chalmers Mfg. Co.

Dryers
*Allis-Chalmers Mfg. Co.
*Bartlett & Snow Co., C. O.
Bonnot Co.
*Hardinge Co.
Iowa Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Fdry. & Mch. Co.
McLanahan and Stone Corp.
Polysius Corp.
*Traylor Engr. & Mfg. Co.
*Tyler Co., W. S.

Dryers (Slurry)
Polysius Corp.

Dust Arresters
American Fdry. Equip. Co.
*Bartlett & Snow Co., C. O.
*Blaw-Knox Co.
Dracco Corp.
*Western Precipitation Co.

Dust Collecting Systems
*Allen-Sherman-Hoff Co.
*Allis-Chalmers Mfg. Co.
American Fdry. Equip. Co.
*Bartlett & Snow Co., C. O.
*Blaw-Knox Co.
Dracco Corp.
Raymond Bros. Impact. Pulv. Co.
*Western Precipitation Co.

Dust Conveying Systems
*Allen-Sherman-Hoff Co.
American Fdry. Equip. Co.
*Bartlett & Snow Co., C. O.
*Blaw-Knox Co.
Dracco Corp.
*Western Precipitation Co.

Dust Handling Systems (Hydro Vacuum)
*Allen-Sherman-Hoff Co.

Dynamite (See Explosives)

Electrical Equipment
*Allis-Chalmers Mfg. Co.

Elevator Belting (See Belting)

Elevators (See Conveyors and Elevators)

Eliminators (Soft Stone) (See Soft Stone Eliminators)

Engineers
*Allis-Chalmers Mfg. Co.
Bacon, Inc., Earle C.
*Bartlett & Snow Co., C. O.
Bonnot Co.
Cross Engr. Co.
Hetherington & Berner, Inc.
Iowa Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
McLanahan and Stone Corp.
Polysius Corp.
*Robins Conveying Belt Co.
*Smidth & Co., F. L.
Sprout, Waldron & Co.
Stephens-Adamson Mfg. Co.
Wellman Engr. Co.

Engine Generator Sets
See Generator Sets (Engine).

Engines (Diesel)
Buckeye Machine Co.
Chicago Pneumatic Tool Co.
Cummins Engine Co.
Nordberg Mfg. Co.

Engines (Hoisting)
*American Hoist & Derrick Co.

Engines (Internal-Combustion)
Buckeye Machine Co.
Cummins Engine Co.
Nordberg Mfg. Co.

Engines (Steam)
*Morris Machine Works
Nordberg Mfg. Co.

Excavating Machinery (See Shovels; Cranes; Buckets, etc.)

Excavators—Shallow Grading (Bucket Elevator Type)
Haiss Mfg. Co., Geo.

Fans (Exhaust)
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.

Feeders
*Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
Bartlett & Snow Co., C. O.
Bonnot Co.
Good Roads Machy. Corp.
*Hardinge Co.
Iowa Mfg. Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Link-Belt Co.
*Pioneer Gravel Equipment Mfg. Co.
*Robins Conveying Belt Co.
Smith Engr. Works
Sprout, Waldron & Co.
Stephens-Adamson Mfg. Co.

Floor Sweeping Systems (Hydro Vacuum)
*Allen-Sherman-Hoff Co.

Fuses (Detonating)
*Ensign-Bickford Co.

Gaskets
Goodyear Tire & Rubber Co.
Republic Rubber Co.

Gasoline Engines (See Engines—Internal-Combustion)

Gas Producers
Wellman Engr. Co.

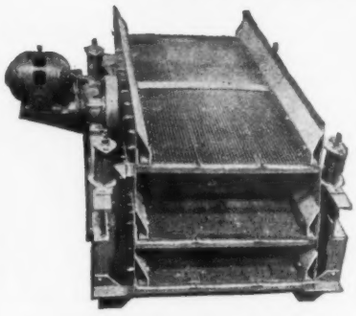
Gates (Bin) (See Bin Gates)

Gates (Clamshell)
Erie Steel Construction Co.
Haiss Mfg. Co., Geo.
*Link-Belt Co.

Gears (Herringbone)
*Bartlett & Snow Co., C. O.
*Jeffrey Mfg. Co.

*** See also information in the 1935 Pit and Quarry HANDBOOK.**

CHAMPION SCREENING and WASHING EQUIPMENT



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CONVEYORS
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CHUTES
GATES

Complete Plants—Portable or Stationary

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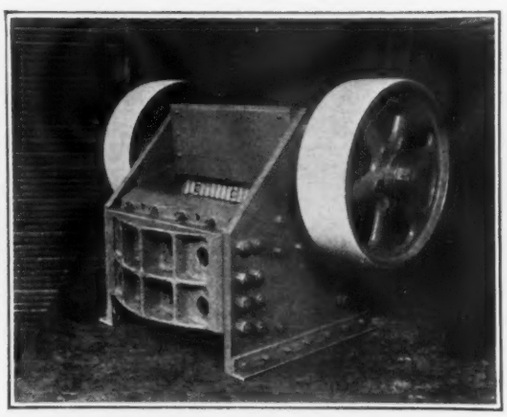
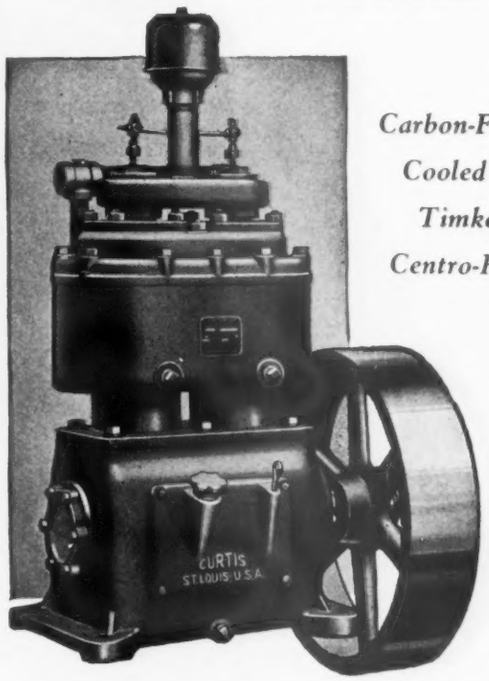
KENNETT SQUARE, PENNSYLVANIA



CURTIS
MODEL "C" COMPRESSORS



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Cooled Air Intake
Timken Bearings
Centro-Ring Oiling

Greater Efficiency and Increased Capacity with no increase in size is a feature of the improved Curtis Model "C" Compressors. A new type head, equipped with large area short intake passages, oversize ports, and straight line air flow, insures maximum efficiency. The result will be *lowered costs* on compressed air for your plant.

The economy of Curtis Model "C" Compressors has been thoroughly demonstrated. Their rugged design makes maintenance costs negligible. Centro-ring oiling provides positive lubrication. Timken bearings assure long life.

CURTIS AIR HOISTS

Low cost lifting up to 10 tons. Costs no more than chain block. Laborer can spot accurately. Abuse-proof. Can't be damaged by overload. Rugged, long-lived.

CURTIS AIR POWER CRANES

Speed Production, Cut Labor Costs. Large wheels, roller bearings, unusually easy running. Pressed steel ends. Costs less to buy.

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1969 KIENLEN AVENUE, ST. LOUIS, MISSOURI
NEW YORK CHICAGO SAN FRANCISCO

CURTIS COMPRESSORS, AIR HOISTS, I-BEAM CRANES AND TROLLEYS

Classified Buyers' Guide

A Directory of PIT AND QUARRY Advertisers Arranged According to Product

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*Link-Belt Co.
Sprout, Waldron & Co.

Gears and Pinions
Haiss Mfg. Co., Geo.
*Jeffrey Mfg. Co.
*Link-Belt Co.
Sprout, Waldron & Co.

Gelatin (See Explosives)

Generators (See Motors and Generators)

Glass Sand Equipment
Lewistown Foundry & Machine Co.

Goggle Parts
Goggle Parts Co.

Goggles
Goggle Parts Co.

Grab Buckets (See Buckets—Clamshell, Orange-Peel, etc.)

Grating (Steel)
*Bartlett & Snow Co., C. O.
*Blaw-Knox Co.
*Hendrick Mfg. Co.
Ryerson & Son, Joseph T.

Grinding Balls (See Balls, Grinding)

Grizzlies
*Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
*Bartlett & Snow Co., C. O.
*Eagle Iron Works
Good Roads Machy. Corp.
*Hendrick Mfg. Co.
Iowa Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Fdy. & Mach. Co.
Manganese Steel Forge Co.
*Robins Conveying Belt Co.
Smith Engr. Works
Stephens-Adamson Mfg. Co.
*Traylor Engr. & Mfg. Co.
Universal Road Machy. Co.

Guards (Machine)
Goggle Parts Co.

Guards (Wire)
*Bartlett & Snow Co., C. O.
Manganese Steel Forge Co.
National Wire Cloth Co.

Guns (Hydraulic)
Hetherington & Berner, Inc.

Hammer Mills (See Crushers—Hammer)

Hoists
*American Hoist & Derrick Co.
*Bartlett & Snow Co., C. O.
Chicago Pneumatic Tool Co.
*Curtis Pneumatic Machy. Co.
*Harnischfeger Corp.
Hetherington & Berner, Inc.
Iowa Mfg. Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.
McLanahan and Stone Corp.
*Pioneer Gravel Equipment Mfg. Co.
*Sauerman Bros., Inc.
Smith Engr. Works
Sprout, Waldron & Co.
*Sullivan Machy Co.
Stephens-Adamson Mfg. Co.

Hoppers
*Hendrick Mfg. Co.
*Link-Belt Co.
Manganese Steel Forge Co.

Hose (Air, Steam and Water)
Chicago Pneumatic Tool Co.
Goodyear Tire & Rubber Co.
Republic Rubber Co.
Self-Vulcanizing Rubber Co.

Hose (Radiator-Engine Cooling)
Goodyear Tire & Rubber Co.
Republic Rubber Co.

Hose Couplings (See Couplings)

Hydraulic Guns (See Guns—Hydraulic)

I-Beam Trolleys
*Curtis Pneumatic Machy. Co.

Idlers
American Manganese Steel Co.
*Bartlett & Snow Co., C. O.
Good Roads Machy. Corp.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.
Smith Engr. Works
Sprout, Waldron & Co.
Stephens-Adamson Mfg. Co.

Indicators (Bin)
Ripley Mfg. Co.

Kilns and Coolers (Rotary)
*Allis-Chalmers Mfg. Co.
*Bartlett & Snow Co., C. O.
Bonnot Co.
*Hardinge Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Polysius Corp.
*Smidth & Co., F. L.
*Traylor Engr. & Mfg. Co.

Kilns (Vertical)
*Hardinge Co.

Kominuters
*Smidth & Co., F. L.

Lenses (Goggle)
Goggle Parts Co.

Lime-Handling Equipment
*Bartlett & Snow Co., C. O.
*Hardinge Co.
Iowa Mfg. Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.
Raymond Bros. Impact Pulv. Co.
*Robins Conveying Belt Co.
Stephens-Adamson Mfg. Co.

Lime and Hydrating Plants
*Hardinge Co.

Lime Kilns
*Bartlett & Snow Co., C. O.
*Hardinge Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.

Linings (Ball- and Tube-Mill) (See Mill Liners and Linings)

Loaders and Unloaders
*Bartlett & Snow Co., C. O.
Good Roads Machy. Corp.
Haiss Mfg. Co., Geo.
Industrial Brownhoist Corp.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.
Sprout, Waldron & Co.
Stephens-Adamson Mfg. Co.

Liquid Rubber
Self-Vulcanizing Rubber Co.

Locomotives (Electric, Gas and Steam)
*Lima Locomotive Works

Locomotives (Trolley-Battery)
*Jeffrey Mfg. Co.

Magnetic Pulleys (See Pulleys, Magnetic)

Manganese Steel
American Manganese Steel Co.
Manganese Steel Forge Co.
Ryerson & Son, Joseph T.

Manganese Steel (Plates and Sheets)
American Manganese Steel Co.
Manganese Steel Forge Co.
Ryerson & Son, Joseph T.

Mechanical Rubber Goods
Goodyear Tire & Rubber Co.
Republic Rubber Co.

Mill Liners and Linings
American Manganese Steel Co.
*Bartlett & Snow Co., C. O.
*Hardinge Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Smidth & Co., F. L.

Mills (Grinding) (See also Crushers—Hammer)
*Allis-Chalmers Mfg. Co.
*American Pulverizer Co.
*Bartlett & Snow Co., C. O.
Bonnot Co.
*Hardinge Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Knickerbocker Co.
Lewistown Fdy. & Mch. Co.
Polysius Corp.
Raymond Bros. Impact Pulv. Co.
*Smidth & Co., F. L.
Sprout, Waldron & Co.
*Traylor Engr. & Mfg. Co.
*Williams Patent Crusher & Pulverizer Co.

Motors and Generators
*Allis-Chalmers Mfg. Co.
*Harnischfeger Corp.

Motors (Internal-Combustion) (See Engines—Internal-Combustion)

Motor Trucks
Hug Co.

Nails
Ryerson & Son, Joseph T.

Netting (Locomotive Stack)
Tyler Co., W. S.

Nozzles (Gravel Washing)
*Deister Concentrator Co.

Nozzles (Hydraulic) (See Guns—Hydraulic)

Nozzles (Spray)
*Deister Concentrator Co.

Nuts
Automatic Nut Co.

Packings
Goodyear Tire & Rubber Co.
Republic Rubber Co.
Self-Vulcanizing Rubber Co.

Partitions (Wire)
National Wire Cloth Co.

Paving Mixers
Jaeger Machine Co.
Koehring Co.

Pawls
Stephens-Adamson Mfg. Co.

Perforated Metal Plates
*Allis-Chalmers Mfg. Co.
*Bartlett & Snow Co., C. O.
Chicago Perforating Co.
Cross Engr. Co.
*Hendrick Mfg. Co.
Ryerson & Son, Joseph T.
Sprout, Waldron & Co.

Pipe Flanges
Hetherington & Berner, Inc.
Ryerson & Son, Joseph T.

Plants (Aggremeter) (See Aggremeter Plants)

Plastic Rubber
Self-Vulcanizing Rubber Co.

Plug Valves (See Valves)

Pneumatic Drills (See Drills, Rock)

Pneumatic Mixing Machinery
Polysius Corp.

Poidometers
Schaffer Poidometer Co.

Portable Conveyors
Haiss Mfg. Co., Geo.
Iowa Mfg. Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.
Sprout, Waldron & Co.
Stephens-Adamson Mfg. Co.

Portable Crushing and Screening Plants
*American Pulverizer Co.
*Austin-Western Road Mchy. Co.
*Bartlett & Snow Co., C. O.
Good Roads Machy. Corp.
*Gruendler Crusher & Pulverizer Co.
Iowa Mfg. Co.
*Jeffrey Mfg. Co.
*Pioneer Gravel Equipment Mfg. Co.
Stephens-Adamson Mfg. Co.
*Williams Patent Crusher & Pulverizer Co.

Portable Engines (See Engines—Internal Combustion)

Portable Loaders (See Loaders and Unloaders)

Power Shovels (See Shovels, Electric, Internal-Combustion and Steam)

Proportioning Equipment
*Blaw-Knox Co.
Schaffer Poidometer Co.

Pulleys (Magnetic)
Sprout, Waldron & Co.

Pulleys (Wing)
Sprout, Waldron & Co.

Pulverized Fuel Systems
*Bartlett & Snow Co., C. O.
Gay, Robert M.
*Hardinge Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Raymond Bros. Impact Pulv. Co.
Universal Road Machy. Co.

Pulverizers (See also Crushers; Mills; etc.)
*American Pulverizer Co.
*Austin-Western Road Machy. Co.
*Bartlett & Snow Co., C. O.
Bonnot Co.
*Gruendler Crusher & Pulverizer Co.
*Hardinge Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Knickerbocker Co.
Lewistown Foundry & Machinery Co.
New Holland Machine Co.
Polysius Corp.
Raymond Bros. Impact Pulv. Co.
*Smidth & Co., F. L.
Traylor Engr. & Mfg. Co.
*Williams Patent Crusher & Pulverizer Co.

Pump Valves (See Valves, Pump)

Pumps (Air-Lift)
Chicago Pneumatic Tool Co.

Pumps (Cement Slurry)
*Allen-Sherman-Hoff Co.
*Morris Machine Works
*Smidth & Co., F. L.

Pumps (Centrifugal)
*Allen-Sherman-Hoff Co.
*Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
Hetherington & Berner, Inc.
Kansas City Hay Press Co.
*Morris Machine Works
Victor Equipment Co.

Pumps (Dredging)
*Allen-Sherman-Hoff Co.
*Allis-Chalmers Mfg. Co.
Hetherington & Berner, Inc.
*Morris Machine Works
Victor Equipment Co.

Pumps (Sand and Gravel)
*Allen-Sherman-Hoff Co.
*Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
Hetherington & Berner, Inc.
Kansas City Hay Press Co.
*Morris Machine Works
Victor Equipment Co.

Pumps (Sump)
Chicago Pneumatic Tool Co.

Pumps (Vacuum)
Chicago Pneumatic Tool Co.

Ready-Mixed Concrete Plants
*Bartlett & Snow Co., C. O.
Erie Steel Construction Co.
Stephens-Adamson Mfg. Co.

Respirator Parts
Goggle Parts Co.

Respirators
Goggle Parts Co.

Rock Drills (See Drills—Rock)

Rod Mills
*Hardinge Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Traylor Engr. & Mfg. Co.

Rods (Welding)
Ryerson & Son, Joseph T.

Roofing and Siding (Steel)
Ryerson & Son, Joseph T.

Rope (Wire) (See Wire Rope)

Rubbish Burners
Cross Engr. Co.

Rust Protection
Self-Vulcanizing Rubber Co.

Safety Equipment
Goggle Parts Co.

Sand Separators
*Bartlett & Snow Co., C. O.
*Jeffrey Mfg. Co.
*Link-Belt Co.
McLanahan and Stone Corp.
*Pioneer Gravel Equipment Mfg. Co.

*** See also information in the 1935 Pit and Quarry HANDBOOK.**

Are You Bothered by Impurities in Your Sand?

If So, Investigate,

THE SIMPLICITY D'CENTEGRATOR

Three years of successful large scale operation removing impurities from sand in a New York Plant.

Write for complete Information or call at our Booth.

Rewashing Gravel over 3′ x 6′ Single

A rewash screen cuts down rejections at very little cost. A 4′ x 8′ Simplicity rewash screen has handled three millions tons of material without expensive repairs.

SIMPLICITY
GYRATING SCREENS

The All Purpose Simplicity Gyrating Screen will produce money saving results in your plant. The Job may be, scalping large stone, grading paving aggregate to exacting specifications, making road gravel, eliminating sand or rewashing aggregate before delivery to truck or car.

Fourteen years of actual operating experience in producing these results enable us to guarantee Simplicity Screens for larger capacities and screening efficiency with low operation cost.

SIMPLICITY ENGINEERING COMPANY
DURAND, MICHIGAN

For Canada: Waterous Limited, Brantford, Ontario

Slackline Bucket Dumping Onto Grizzly

Long Range Machines

for Pit, Bank and River Digging—Stripping—Storing and Reclaiming

SAUERMAN DRAG SCRAPERS and SLACKLINE EXCAVATORS are the most economical equipment for almost every problem of moving earth or bulk materials distances of 200 to 1,000 ft. or more. Sizes range from portable units for small pit operations up to huge machines able to handle 600 tons per hour. Dig and haul in one operation. Write for Catalog.

SAUERMAN BROS., Inc.

434 S. Clinton St. CHICAGO

Small Drag Scraper with Portable Plant

Classified Buyers' Guide

A Directory of PIT AND QUARRY Advertisers Arranged According to Product

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Simplicity Engr. Co.
Smith Engr. Works
Stephens-Adamson Mfg. Co.

Sand—Lime—Brick Machinery
*Hardinge Co.

Sand-Settling Tanks
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Good Roads Machy. Corp.
Iowa Mfg. Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.
Smith Engr. Works
Stephens-Adamson Mfg. Co.

Scales
Merrick Scale Mfg. Co.

Scrapers (Power Drag)
*Austin-Western Road Machy. Co.
Iowa Mfg. Co.
*Link-Belt Co.
*Pioneer Gravel Equipment Mfg. Co.
*Sauerman Bros., Inc.

Screens
*Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
Audubon Wire Cloth Corp.
Bacon, Inc., Earle C.
*Bartlett & Snow Co., C. O.
Chicago Perforating Co.
Cleveland Wire Cloth & Mfg. Co.
Cross Engr. Co.
*Deister Concentrator Co.
*Deister Machine Co.
*Eagle Iron Works
Gay, Robert M.
Good Roads Machy. Corp.
*Gruendler Crusher & Pulverizer Co.
Haiss Mfg. Co., Geo.
*Hardinge Co.
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Industrial Brownhoist Corp.
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*Jeffrey Mfg. Co.
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Manganese Steel Forge Co.
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*Roebling's Sons Co., John A.
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Stephens-Adamson Mfg. Co.
Symons Bros. Development Co.
*Traylor Engr. & Mfg. Co.
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Screens (Vibrating or Shaking)
*Allis-Chalmers Mfg. Co.
*Austin-Western Road Machy. Co.
*Bartlett & Snow Co., C. O.
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*Deister Machine Co.
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*Gruendler Crusher & Pulverizer Co.
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*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Machinery Co.
*Link-Belt Co.
McLanahan and Stone Corp.
New Holland Machine Co.
Nordberg Mfg. Co.
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*Productive Equip. Corp.
*Robins Conveying Belt Co.
Simplicity Engr. Co.
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Stephens-Adamson Mfg. Co.
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*Tyler Co., W. S.

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Polysius Corp.
*Smidth & Co., F. L.

Sheaves
*Allis-Chalmers Mfg. Co.
*American Hoist & Derrick Co.
American Manganese Steel Co.
*Eagle Iron Works
*Gruendler Crusher & Pulverizer Co.
Haiss Mfg. Co., Geo.
Hetherington & Berner, Inc.
*Link-Belt Co.
*Jeffrey Mfg. Co.
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Sprout, Waldron & Co.

Shovels (Electric, Internal-Combustion and Steam)
*American Hoist & Derrick Co.
*Austin-Western Road Machy. Co.
*Bay City Shovels, Inc.
*Harnischfeger Corp.
Industrial Brownhoist Corp.
Koehring Co.
*Lima Locomotive Wks., Inc.
*Link-Belt Co.
Michigan Power Shovel Co.
Osgood Co.
Thew Shovel Co.
Universal Crane Co.

Skip Hoists and Skips
*Allis Chalmers Mfg. Co.
*American Hoist & Derrick Co.
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Hetherington & Berner, Inc.
*Jeffrey Mfg. Co.
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*Robins Conveying Belt Co.
Stephens-Adamson Mfg. Co.

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Soft Stone Eliminators
Knickerbocker Co.

Speed Reduction Units
Iowa Mfg. Co.
*Link-Belt Co.

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*Deister Concentrator Co.

Sprockets and Chain
American Manganese Steel Co.
*Bartlett & Snow Co., C. O.
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*Jeffrey Mfg. Co.
*Link-Belt Co.
Sprout, Waldron & Co.
Stephens-Adamson Mfg. Co.

Stabilized Road Mix
Calcium Chloride Assn.

Stackers
*Jeffrey Mfg. Co.

Steel (Alloy)
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Steel (Abrasion Resisting)
Ryerson & Son, Joseph T.

Steel (Bars, Shapes, Plates, etc.)
Ryerson & Son, Joseph T.

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Steel Inclines (See Inclines, Steel)

Steel Plate Construction
*Hendrick Mfg. Co.
Hetherington & Berner, Inc.
Manganese Steel Forge Co.
Sprout, Waldron & Co.

Storage Equipment
*Bartlett & Snow Co., C. O.
Haiss Mfg. Co., Geo.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Sauerman Bros., Inc.

Sweatbands
Goggle Parts Co.

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*Allen-Sherman-Hoff Co.

Tanks
*Bartlett & Snow Co., C. O.
*Hendrick Mfg. Co.
*Link-Belt Co.

Tanks (Sand-Settling)
*Bartlett & Snow Co., C. O.
Good Roads Machy. Corp.
Iowa Mfg. Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Pioneer Gravel Equipment Mfg. Co.
Smith Engr. Works
Stephens-Adamson Mfg. Co.

Testing Sieves and Shakers
*Hendrick Mfg. Co.
*Tyler Co., W. S.

Thawing Equipment
Aeroil Burner Co.

Thickeners (Slurry)
*Hardinge Co.

Tire Repair Materials
Goodyear Tire & Rubber Co.

Tires (Passenger Car, Tractor and Truck)
Goodyear Tire & Rubber Co.

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Torches (Thawing)
Aeroil Burner Co.

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Nordberg Mfg. Co.

Tractors
*Allis-Chalmers Mfg. Co.

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Hug Co.

Tramways (Aerial)
*Roebling's Sons Co., John A.

Transformers
*Allis-Chalmers Mfg. Co.

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Transmission Machinery
*Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
*Bartlett & Snow Co., C. O.
*Gruendler Crusher & Pulverizer Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.
Stephens-Adamson Mfg. Co.

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Good Roads Machy. Corp.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.
Stephens-Adamson Mfg. Co.

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*Bartlett & Snow Co., C. O.
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Jaeger Machine Co.

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Tubes (For Tire Casings)
Goodyear Tire & Rubber Co.

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*Allis-Chalmers Mfg. Co.
*Bartlett & Snow Co., C. O.

Unloaders (Box Car)
*Bartlett & Snow Co., C. O.
*Jeffrey Mfg. Co.
*Link-Belt Co.
Stephens-Adamson Mfg. Co.

Variable Speed Reducers or Transmissions
*Link-Belt Co.
Stephens-Adamson Mfg. Co.

Vibrating Screen Plate
*Bartlett & Snow Co., C. O.
Chicago Perforating Co.
Cross Engr. Co.
*Hendrick Mfg. Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.
Manganese Steel Forge Co.
Morrow Mfg. Co.

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Vibrators
*Jeffrey Mfg. Co.
*Tyler Co., W. S.

Wagons (Dump)
Koehring Co.
Le Tourneau, Inc., R. G.

Washers (Sand, Gravel and Stone)
*Allis-Chalmers Mfg. Co.
*Bartlett & Snow Co., C. O.
*Eagle Iron Works
Good Roads Machy. Corp.
Haiss Mfg. Co., Geo.
*Hardinge Co.
Iowa Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Knickerbocker Co.
Lewistown Foundry & Mach. Co.
*Link-Belt Co.
McLanahan and Stone Corp.
*Pioneer Gravel Equip. Mfg. Co.
*Smidth & Co., F. L.
Smith Engr. Works
Stephens-Adamson Mfg. Co.
*Traylor Engr. & Mfg. Co.
*Tyler Co., W. S.
Universal Road Machy. Co.

Weighing Equipment (Automatic)
*Blaw-Knox Co.
Johnson Co., C. S.
Merrick Scale Mfg. Co.
Schaffer Poidometer Co.

Welding and Cutting Equipment
Ryerson & Son, Joseph T.

Welding Helmets and Shields
Goggle Parts Co.

Welding Supplies
American Manganese Steel Co.
Manganese Steel Forge Co.
*Roebling's Sons Co., John A.
Ryerson & Son, Joseph T.

Well Drills (See Drills—Well)

Wheels (Car)
American Manganese Steel Co.
*Eagle Iron Works
Iowa Mfg. Co.

Wheel Rims. See Rims—Wheel

Winches and Capstans
*Bartlett & Snow Co., C. O.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.
Sprout, Waldron & Co.
Stephens-Adamson Mfg. Co.

Wire and Cable (Electric)
*Roebling's Sons Co., John A.

Wire Cloth
Audubon Wire Cloth Corp.
Cleveland Wire Cloth & Mfg. Co.
Ludlow-Saylor Wire Co.
Manganese Steel Forge Co.
National Wire Cloth Co.
*Robins Conveying Belt Co.
*Roebling's Sons Co., John A.
Tyler Co., W. S.

Wire Rope
American Cable Co.
Hazard Wire Rope Co.
*Roebling's Sons Co., John A.
Ryerson & Son, Joseph T.
Williamsport Wire Rope Co.

Wire Rope Fittings
American Cable Co.
*American Hoist & Derrick Co.
Hazard Wire Rope Co.
*Roebling's Sons Co., John A.
Ryerson & Son, Joseph T.
Williamsport Wire Rope Co.

Wire Rope Slings
American Cable Co.
Hazard Wire Rope Co.
*Roebling's Sons Co., John A.
Williamsport Wire Rope Co.

Wire (Welding)
American Manganese Steel Co.
Manganese Steel Forge Co.
*Roebling's Sons Co., John A.
Ryerson & Son, Joseph T.

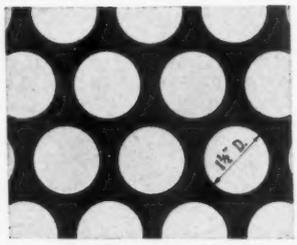
Worm Gears (See Gears and Pinions)

*** See also information in the 1935 Pit and Quarry HANDBOOK.**

PERFORATED PLATE . . .

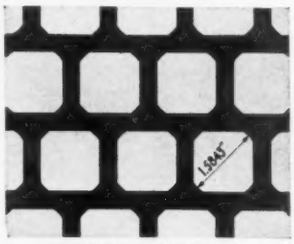
with the Style of Opening Suited to the Job

BY HENDRICK



ROUND

1½" opening . . . ⅜" bar . . .
58% open area
provides the most accurate, uniform sizing.



SQUAROUND

1—" opening . . . ⅜" bar . . .
58% open area
strong screen plate that provides accurate sizing.

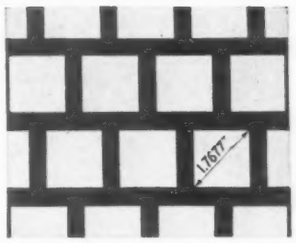
How slightly the shape of your perforated plate openings affects screen capacity, when *equivalent* sizes are compared, can be seen from the drawings reproduced here.

Despite variations in the size of the openings, plate made with any of these four shapes will provide equivalent open area . . . and deliver a product of approximately equivalent size.

Thus it is the nature of your screening work that should determine the shape of opening to be used.

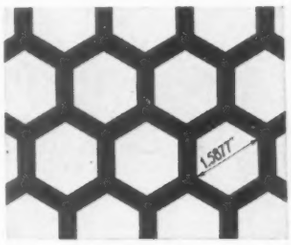
With facilities for producing any needed shape of opening, Hendrick is in position to counsel with you and recommend the most effective screening medium for your job. Consult us.

HENDRICK MANUFACTURING CO.
39 Dundaff St., Carbondale, Pa.
SALES OFFICES IN PRINCIPAL CITIES
PLEASE CONSULT TELEPHONE DIRECTORY
Makers of Elevator Buckets of all types, Mitco Open Steel Flooring, Mitco Shur-Site Treads and Mitco Armorgrids. Light and Heavy Steel Plate Construction.



SQUARE

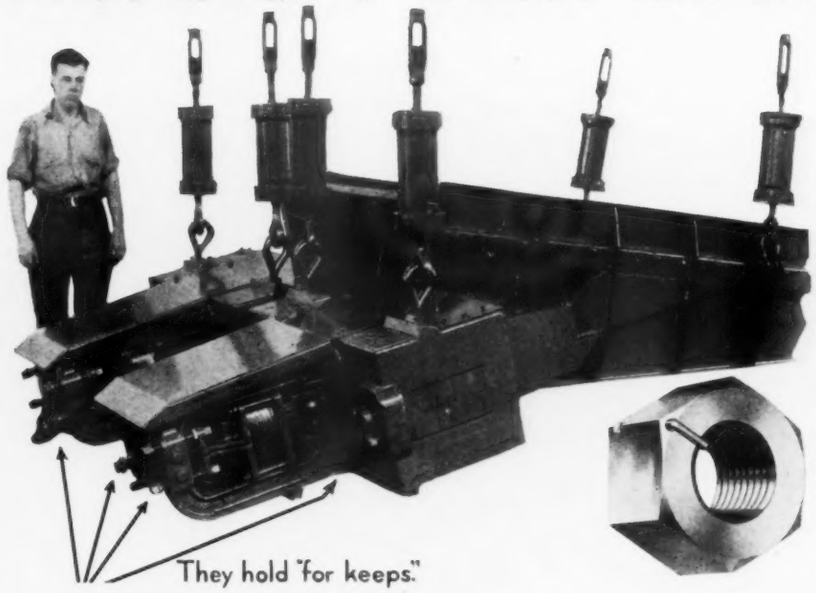
1¼" opening . . . ⅜" bar . . .
59% open area



HEXAGONAL

1⅜" opening . . . ¾" bar . . .
62% open area
Accurate sizing . . . large open area.

Vibrators can't shake 'em loose



Locked on with an ordinary wrench, ANCO NUTS need no further attention. Lock automatically with positive, permanent grip. No shutdowns for tightening. Yet, the same wrench loosens them and they can be used over and over again.

ANCO NUTS are used on the powerful Jeffrey-Traylor electric vibrating feeders furnished on the Grand Coulee Dam. There are eight of these big 4' x 7½' feeders, each motivated by two heavy-duty vibrating motors at high speed of 7200 oscillations per minute, day after day. This is the most severe test that could possibly be applied to any bolted parts—yet ANCO NUTS hold fast with an unshakeable grip.

Specify ANCO NUTS for all machine parts subject to shock, vibration and strain. Let us send you samples for test—just mention size, and whether standard thread, U.S.S. or S.A.E. is required.

Automatic Nut Company
Chrysler Building **New York City**

ANCO NUTS

FOR USE WHEREVER A GOOD NUT IS REQUIRED, SCREENS, CONVEYORS, CLAM SHELL BUCKETS, CRUSHERS, ETC.

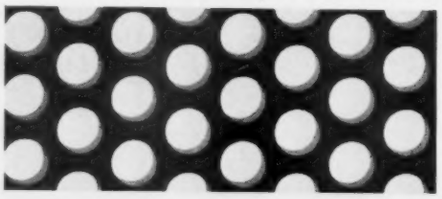
You'll Find Plus Value in

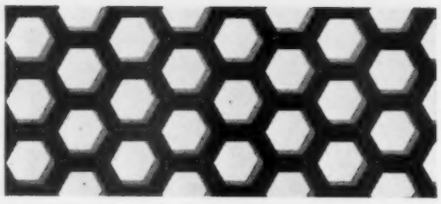
+ + + + + CROSS + + + + +

PERFORATED PLATES

FOR VIBRATING, ROTARY AND SHAKING SCREENS

The exact opening you need, PLUS the best metal for your conditions, PLUS skillful, accurate workmanship, PLUS the quick and sure service of CROSS; will add PLUS dollars to your 1936 balance sheet.



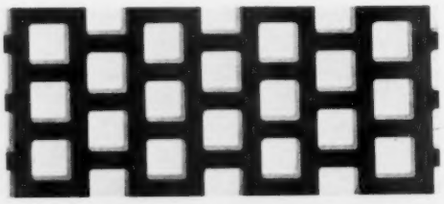


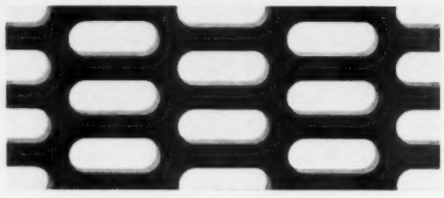
ROUND holes, for accuracy and wear.

SQUARE holes, for capacity.

HEXCREEN holes, for best combination of accuracy, capacity and wear.

SLOTTED holes, for special conditions.





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Sales representatives in principal cities

MULTICLONE DUST COLLECTING SYSTEMS

For the collection of all powdered materials and all process dusts, either as products or waste, Multiclones give maximum efficiency in small space. They recover smaller particles than can be handled by any other centrifugal system.

Western Precipitation Co.
Los Angeles New York

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1016 West 9th Street, Los Angeles, Calif.

Please send descriptive booklet on Multiclones.

Our problem is.....

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Our Pledge to You When You Visit

DETROIT

NO HIGHER

$2. $2.50 $3.

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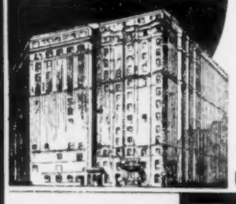

That's our offer—every single room with private bath. $2. $2.50 $3.

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HOTEL TULLER

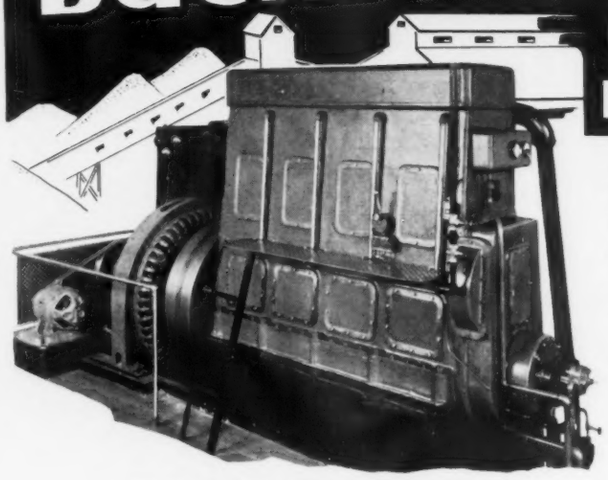
800 ROOMS

CLIFFORD R. TAYLOR, *Managing Director*

A magnificent modern hotel right in downtown Detroit. Fine food at low cost.

IF LOWER POWER COSTS INTERESTS *you*

LET A BUCKEYE DIESEL ENGINE *Pay its own way* IN YOUR OWN PLANT



SIZES 40 H. P. UP TO 600 H. P.
BELT DRIVES OR GENERATOR SETS CAN BE FURNISHED

"The Buckeye Savings Purchase Plan" permits most Companies to install economical Buckeye Diesel Engines in their plants with only a small cash outlay, paying for the new cost-reducing equipment out of savings effected over former power cost while the Diesels operate the plant.

Ordinarily in two or three years the savings will pay for the Diesel Plant. After the pay-off period they are yours and you have something to show for money formerly paid out for power. The Diesels will still be good for many years of economical and reliable service, and above all you will increase your profits 40% to 60% of the former steam or electric power bills.

Let us explain this money-saving proposition. No cost. Write today.

The BUCKEYE MACHINE CO. Engine Builders Since 1908 **Lima, Ohio**

BE PROFITWISE AND DIESELIZE *with Buckeye*

CONVEYING
SCREENING
WASHING
EQUIPMENT

Complete Plants

Designed - Equipped - Erected

For More Than Thirty Years many of the best and most efficient plants have been designed and built by Stephens-Adamson, or have been equipped with Stephens-Adamson units.

S-A engineers are always on the alert to develop new and better methods for washing, screening and handling sand, gravel, stone and cement.

New and improved units are constantly being introduced to produce better, cleaner material and to permit greater output at lower cost.

Check This List and write for details:

Belt Conveyors	Vibrator Screens
Belt Conveyor Carriers	Revolving Screens
Bucket Elevators	Washers & Classifiers
Feeders	Gates, Chutes & Spouts
Grizzlies	Complete Plants

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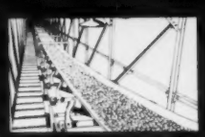
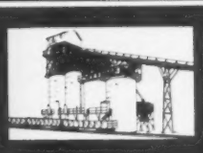
59 Ridgeway, Aurora, Illinois
Los Angeles, Calif. - - - - - - - Belleville, Ontario



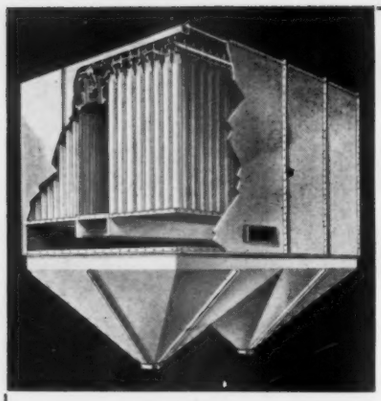
S-A Belt Conveyor

STEPHENS-ADAMSON MFG. CO.

Engineers - Manufacturers - Contractors



S-A Gravel Plant



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Health Hazards can be controlled at their source by the use of the American Dustube Dust Collectors.

Wherever there is cement, lime, gypsum, crushed stone or other dry articles being crushed, pulverized, conveyed or processed, Dustube Collectors solve the problem and reclaim the dust.

Send for folder number 222.

The American Foundry Equipment Co.
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Your Policy Is Folder No. 222

DUSTUBE COLLECTORS

Buy A "Haiss"

BECAUSE it is the most successful, most satisfactory and most profitable—which fact you can confirm from users, and reason out from reading the Haiss catalogs. Four Standard Haiss Loaders—1 to 5 yds. per minute.

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George Haiss Manufacturing Co., Inc.
142d St. & Rider Ave., New York, N. Y.
Builders also of HAISS ELEVATORS—SCREENS—CLAMSHELL BUCKETS

BACON FARREL CRUSHERS

Complete Plants Designed and Equipped. Screens, Elevators, Conveyors, Quarry, Sand and Gravel Plant Equipment. Engineering Service.

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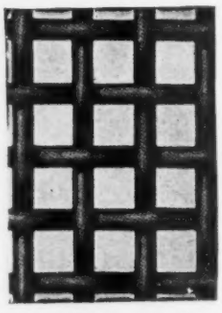

- ★ Withstands vibration without crystallization
- ★ Super-tough to resist abrasion
- ★ Maintains accuracy throughout life of screen
- ★ Has outworn other special alloy cloths
- ★ Economical in price and serviceability

WRITE FOR BULLETIN

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Foot of Belle Street, St. Paul, Minn.

HYDROSEAL DREDGE PUMP

Unique principle of hydrosealing both sides of the impeller against abrasive wear, cuts maintenance to a fraction and saves ⅓ in power costs in pumping sand, gravel, rock and other abrasive materials—Estimated economies guaranteed. Sizes 2" to 22", pulley or motor drive. Descriptive Catalog sent on request.

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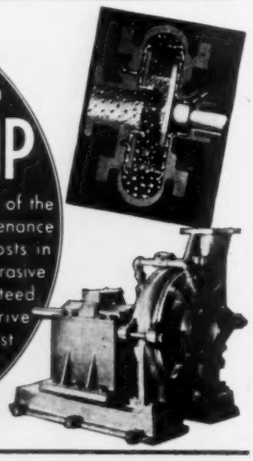

NINTH ANNUAL SOUTHWEST ROAD SHOW AND SCHOOL

FEBRUARY 25, 26, 27, 28, 1936

SOUTHWEST'S LARGEST ASSEMBLY OF MEN, MACHINERY and MATERIALS

Complete data sent upon request

SOUTHWEST ROAD SHOW AND SCHOOL
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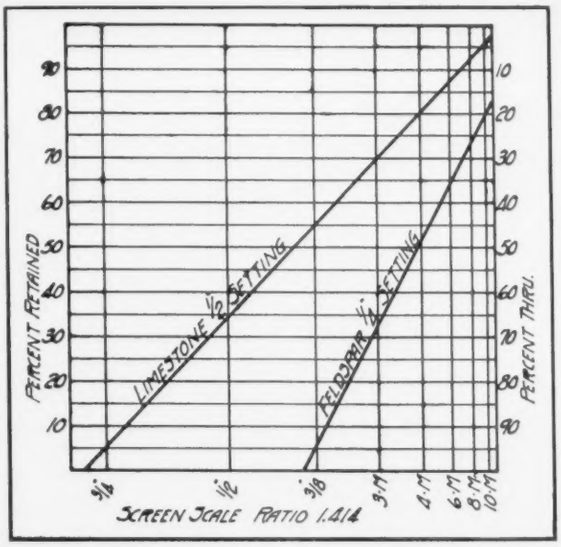


PERFECT CRUSHING

The well known axiom, "The line of perfect crushing," indicates that the closer the plotted curve approaches a straight diagonal line, the nearer the actual crushing is to the ideal.

The above curves taken from actual tests show a straight line, "the line of perfect crushing." The Bonnot Reduction Crusher not only approaches the straight line or the ideal, it is ideal or perfect. The Bonnot Company can be, and is, justly proud of this performance.

PERFECT CRUSHING Means to the Operator—

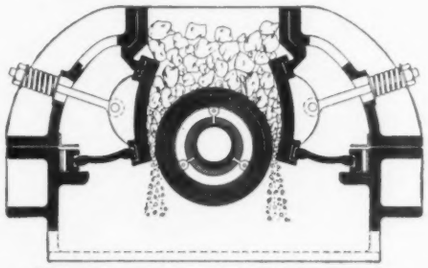
Less maintenance; no rubbing or abrasive action to produce fines.

Less rejections; no oversize or slabs to appear in the finished product.

Less power; perfect crushing means free crushing, a beam or snap action that cuts down power—30 tons per hour of 1" minus material with less than 9 horsepower.

Increased production; slabs and oversize build up a circulating load, thus cutting down production.

Increased profits—less maintenance, less power and increased production.



Not a roll crusher. Featuring slow creep mantle for distribution of wear.

Manufactured under U. S. Patent No. 1946763

750 BLOWS PER MINUTE

THE BONNOT CO.

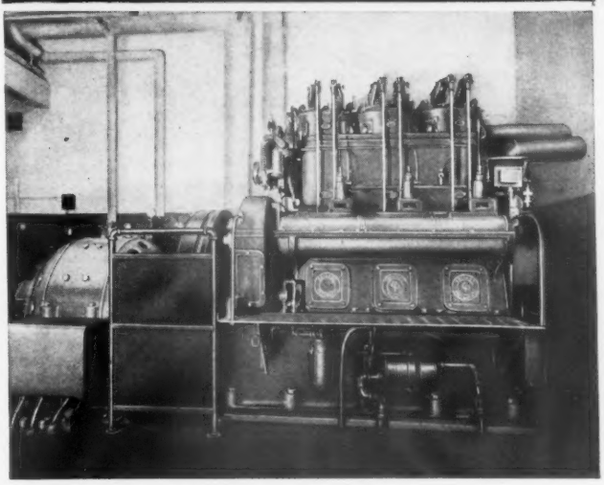
CANTON, OHIO

— SINCE 1891 —

New York Office: 50 Church Street

Diesel Economy Is Greatest With CP DIESELS

80 to 800 H. P.



A CP Diesel Engine, 150 HP, supplying power and light for a large industrial plant

Numerous CP Diesel engine installations in Quarries, Ice Plants, Flour Mills, Office Buildings, Industrial Plants, etc., have brought power and light costs down to ONE CENT per K.W.H.—or less. Let us make a power survey without cost to you and submit our findings.

CHICAGO PNEUMATIC TOOL COMPANY

Engine Builders for More Than 30 Years

Sales and Service Branches All Over the World

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AIR & GAS COMPRESSORS • ROCK DRILLS
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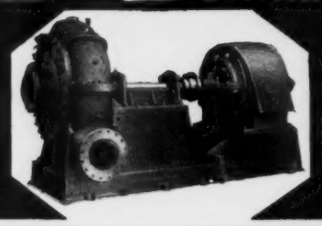
Ryerson Abrasion Resisting Sheets and Plates Last Longer

This new type of steel resists wear many times longer than ordinary steel. Write for complete data—also stock list showing steel of every kind, shape, and size. Immediate shipment assured. Joseph T. Ryerson & Son, Inc., Chicago, Cincinnati, Milwaukee, Boston, Detroit, Philadelphia, Cleveland, Buffalo, St. Louis, Jersey City.

RYERSON STEEL

MORRIS
CENTRIFUGAL PUMPS



For handling sand, gravel, slurry, or clear water. Special designs and materials for each service. Also Hydraulic Dredges for sand and gravel production, deepening or enlarging lakes, reservoirs, waterways, etc.

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MORRIS MACHINE WORKS
Baldwinsville, N. Y.

MORRIS MACHINE WORKS • BALDWINSVILLE, N.Y.

SCALES—

The Merrick Weightometer so combines the principles of a platform scale and a mechanical integrator as to record the total weight of material carried by a moving conveyor, without in any way interfering with the operation of the conveyor or need of a weighmaster.

The Merrick Mechanical Weighman is adaptable to all kinds of platform scales — overhead telpher and industrial railway systems, tanks or hoppers.

The Merrick Addoweight is a dial scale with additional features of two counters—one to totalize the weights and the second to count the number of weighings. Used for individual loads on conveyors or monorails.

The Merrick Feedoweight mechanically regulates the feed, as well as weighing and registering the weight, of one or more materials.

MERRICK SCALE MANUFACTURING CO
182 Autumn St. Passaic, N. J.

Lewistown Foundry Products
ARE
Performance-Tested

BUCKET ELEVATORS
REVOLVING SCREENS
CRUSHERS DRY PANS

Lewistown Foundry & Machine Co.
Lewistown, Pa.

WILLIAMS BUCKETS

In Williams buckets you will find many outstanding engineering achievements, all features combine to bring you bigger payloads, dependability and longer lasting service. **Write for bulletins.**

Multiple-Rope Power-Arm Dragline

THE WELLMAN ENGINEERING CO.
7014 Central Ave. CLEVELAND, OHIO

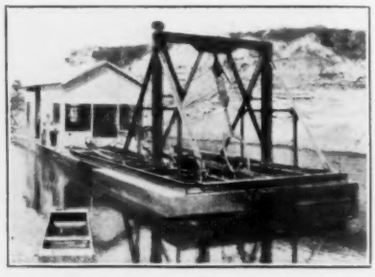
Perforated Metals — Screens of All Kinds — For Sand, Gravel, Stone, Etc.
MATERIAL IN STOCK
PROMPT SHIPMENT
CHICAGO PERFORATING CO.
2435 West 24th Place
Tel. Canal 1459 CHICAGO, ILL.

LIGHTNING
Heavy-Duty (Ball-Bearing) Sand and Gravel PUMPS

High efficiency — low operating cost—precision workmanship — wear-resisting, non-heating bearings even when operated under extremely high heads. WRITE

KANSAS CITY HAY PRESS CO.
KANSAS CITY, . . . MO.

EAGLE SWINTEK SCREEN NOZZLE LADDER LOWER YOUR COST

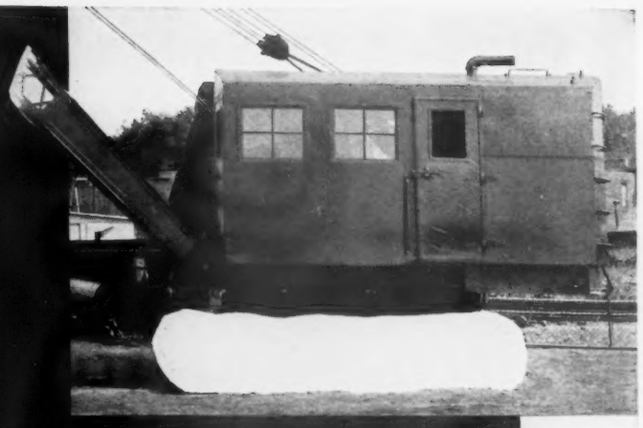


Will eliminate stoppages and slug pumping — insuring an even, constant feed of solids to the suction nozzle — with less power — greatly decreasing the cost per yard of material produced.

Write for descriptive literature and let us tell you how this can be done with your dredge.

Eagle Iron Works
Des Moines, Iowa

WHAT ABOUT CRANE MOUNTINGS ?



Are low handling costs and dependability what you demand in a crane? Then give as much thought to the mounting as to the design of the superstructure. Railroad trucks differ greatly from crawlers—in travel speeds, switching ability, price, upkeep cost and the ease of moving from one job to another. Building a complete line of both crawler and locomotive cranes, we will gladly tell you the advantages of each type and which is best suited for your particular service.

GENERAL OFFICES
BAY CITY, MICHIGAN

INDUSTRIAL BROWNHOIST

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A CUSTOMER SAYS

(Of PLAT-O Vibrating Screens)

"July, 1930, we purchased from you a Type 246 PLAT-O or Double Deck Vibratory Sand Screen, size 4'x6', serial No. 124. We have this particular unit in operation along side of two other Vibratory Screens of another make and found your own screen so satisfactory that we believe it would be good economy, because of the low up-keep in cost, to consider the installation of another such unit in place of the other two units."

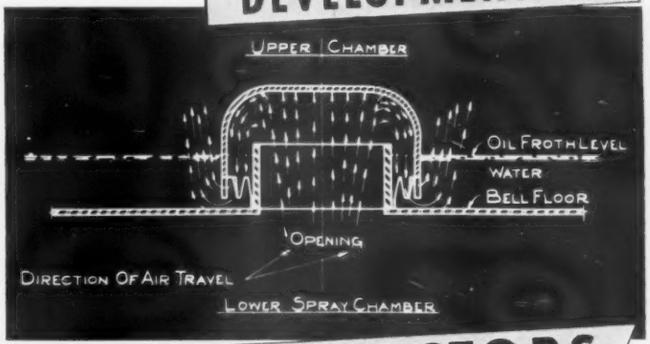
We will, upon request, furnish you the name of this customer and location of his PLAT-O Screen so you may investigate for yourself and profit by his experience.

Write for descriptive Bulletin No. 22

DEISTER MACHINE COMPANY

1933 East Wayne Street — Fort Wayne, Indiana

THE NEWEST DEVELOPMENT IN



DUST COLLECTORS

•Investigate the savings that this efficient dust collector can make in your plant. No moving parts—no manual supervision—no replacement of filtering units—no wear—no fire hazard. Highly efficient. Descriptive literature sent on request. The C. O. Bartlett & Snow Company, 6197 Harvard Avenue, Cleveland, Ohio. Representatives in the principal cities.

BARTLETT-SNOW *Dust Collectors*

CONVEYORS • ELEVATORS • SKIP HOISTS • FEEDERS
CHAINS • SPROCKETS • DRYERS • COOLERS • SCREENS

MUST BE SOLD!

We have taken over the following equipment and must liquidate immediately:

CRANES—DRAGLINES AND SHOVELS
3—Marion model 21, steam crane & dragline.
1—Link-Belt 1¼ yd., gas crane and dragline.
1—Northwest 1¼ yd., gas crane and dragline.
1—P&H 206 shovel and crane; also 700 crane.
1—Byers Bearcat crane.
1—Ohio 25 ton std. ga. loco. crane.
1—Set P&H shovel attachments for model 206.
1—Northwest pullshovel and P&H attach.

BUCKETS
10—Clamshells, ½ to 1½ yd. Owen-Williams, Kiesler and Blaw-Knox.
Also large number tower, well and dragline.

HOISTING ENGINES
12—Gas, steam and electric, single, double and triple drum.

PUMPS
45—These include road, centrifugal, diaphragm, triplex and other kinds.

ROAD & PAVING EQUIPMENT
1—Ord finishing double screed for 15-18-24 ft.
1—Lakewood single screed will sell for parts.
1—Austin mammoth senior, 12 ft. leaning wheel grader.
2—Lakewood 18 and 20 ft. subgraders.
2—10 ton 3 wheel road rollers.
1—Model 60 caterpillar tractor used very little.
1—Austin Scarifier.

We also have: **Derricks*, Concrete Mixers, Saw Rigs, Locomotive Cars, Air Compressors, etc. Also Steel Blocks, Cable, etc.**

RENNOLDS MACHINERY COMPANY
3901 E. 106'h St., Chicago
Tel.: SO., Chicago 3900

Tunnel Contractor's Plant

2—Ottumwa heavy duty mine hoists, rigid drum 48" dia., 48" face, 6" flange, grooved for 1" rope, 10,000 lb. hoisting duty; 100 hp., 3 phase, 60 cycle, 440 volt G. E. slip ring motor, reversing controller, post brake and thrustor emergency brake, dial indicator.
2—110 C.F.M. gas portable compressors.
4—640 and 1—750 C.F.M. Class WJ3 Sullivan compressors.
1—Symons 3-ft. crusher.
1—24x36 Worthington crusher.
2—12" Traylor crushers.
1—D. C. D.D. 7x10 steam hoist.
3—100 hp. Lidgerwood dragline hoists, electric.
1—50 hp. Sullivan dragline hoist.
Concrete mixers, centrifugal pumps, motor trucks, air receivers, gas and electric locomotives.

Priced for quick sale.

Wenzel & Henoch Construction Co.
Gilbertville, Mass.

Model 105 Northwest Crane.
1½ yd. Cap. 60 ft. Span Bucket, O E T Crane.
2 Bucyrus 2 yd. Diesel Draglines.
Lima 1½ yd. Shovel and Crane.
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6—14 ton Whitcomb Gas. Locos., 36 ga.
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750-1250-1800 yd. Asphalt Plants.
Traylor 36-16 Sand Rolls.
36x18, 30x15, 24x13, 30x10 Jaw Crushers.
Champion 1030 & 1040 Roller Bearing Jaw Crushers.
Acme 18x11 Model 9½D Jaw Crusher.
Worthington 36x24 Jaw Crusher
Allis Chalmers 48x36 Jaw Crusher.
5½ ft., 7 ft. Symons Cone Crushers.
Traylor 4—10TZ Reduction Crushers.
18 in. and 24 in. Symons Disc Crushers.
No. 0 Raymond Lime Pulverizer.
6 ft. by 8 ft. Traylor, Tube Mill.
Bonnot No. 4 Tube Mill 4x22.
Pennsylvania SX4 and SX6 Pulverizers.
Portable Air Compressors: 110-220 and 320' cap.
Orange Peel Buckets: 5 ft. to 48 ft. cap.
1730 ft. Chicago Pneumatic Elec. Air Comp.
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10 in. & 36 in. Superior McCully Crushers.
365 ft. Chicago Pneumatic Elec. Comp.

Complete Plants Bought and Sold.

R. C. STANHOPE, INC.
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AIR COMPRESSOR SPECIALISTS

We have in stock at all times, upwards of two hundred AIR COMPRESSORS of various sizes and makes, to meet practically any requirement or condition. We maintain a force of expert mechanics in charge of one of the best compressor men in the country.

EVERY COMPRESSOR THAT WE SELL IS GUARANTEED TO BE MECHANICALLY AS GOOD AS NEW WHEN IT LEAVES OUR PLANT.

Send Us Your Inquiries

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17-19 W. South St. Indianapolis, Ind.

FOR SALE

Monighan 3-W Diesel dragline, 75' boom 3 yd.
Diesel-Electric Drag., 3½-4 yd., 115-100' boom.
Hammermill Williams No. 4 Jumbo, A-1.
Shovel Fronts—P&H 206, NW, L-B K-55, etc.
Sauerman 1 yd. Drag Scraper Hoist, belted, inc. bucket & blocks, A-1. Might trade for slackline.
Sauerman 1 yd. Drag Scraper Hoist & Bucket, electric. Will equip with gas or Diesel if desired.
Jaw Crushers—9x16 & 10x20 port. Also 7x12 to 66x84.
Reduction Crushers—5½' Cone, No. 7 Newhouse, etc.
Gas. Cat. Dragline, 50' boom, good shape, $1,250.
Loaders—Several Barber-Greenes, Haiss, L-B, etc.
Dump Truck—2½ ton GMC, Woods hoist, pneu. tires.
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Gas Locomotives—3½ to 50 tons, msc. gauges.
Bucket Elevators, Conveyors, Apron Feeders.
Diesel and Gas engines & generators, 1½ to 1200 HP.
50—Shovels, Cranes & Draglines, ⅝ to 6 yds.

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For Sale at Bargain Prices

1—Westinghouse 250 H.P. 4000 Volts, 60 Cycle, 3 phase, 600 RPM, 1 PF Synchronous Motor, with base, pulley, direct connected exciter.

1—Westinghouse standard starting and running panel with auto transformers, meters, etc., complete. Late type unit in A-1 condition. Has ammortissuer winding and can be used as generator.

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I have exceptional bargains in slightly-used and new equipment located throughout Canada and the United States. Let me know what you need, no matter what it is, and I will quote on all suitable items I have in your territory. Some of the items available (many sizes, types and makes) are:

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Conveyors	**Hoists**	**Scales**
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3—Hardinge Mills, 4½'x16", 5'x22", 8'x30".
3—Jaw Crushers 10"x7", 24"x12", 30"x 60".
2—Sturtevant No. 1, No. 1½ Rotary Fine Crushers.
4—Gates Gyratory Crushers No. 3D, No. 6D.
5—Traylor Crushing Rolls, 42"x18", 36"x 16".
3—Raymond Mills, two roll, four roll.
6—No. 0000, 000, 00 Raymond Mills.
2—Rod Mills 5x10', 4x10'.
2—12" Traylor Bulldog Gyratory Crushers.
1—Symons 7' Cone Crusher.
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Jaw Crushers—2"x4" up to 66"x84".
Crushing Rolls—12"x12" up to 54"x64"—Gyratory Crushers.
Ring Roll Mills—No. 0 and No. 1—Swing Hammer Mills.
Rotary Fine Crushers—No. 1, No. 1½, No. 2.
Direct Heat Rotary Dryers—4'x30', 5'x30', 5½'x40', 6'x50' and 7'x50'.
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Rebuilt Air Compressors.
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½ yd. Drag Scraper Outfit.
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1 yd. Drag Scraper Outfit.
2 yd. Electric Drag Scraper Outfit.
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½ yd. Slackline Outfit.
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COMPLETE—NEW 36" CONVEYOR FOR SALE AT SACRIFICE PRICE.

250 Troughing Idlers. 150 Return Idlers. All Head & Tail Pulleys with Shafts and Bearings—Complete Set of New Gears—Angle Iron I Beams, Channel Iron and Other Parts to Make Up a Complete 36" Conveyor. (Robbins Conveyor Co. Make.)
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App. 350 Ft. of New 36"x6 Ply Rubber Covered Conveyor Belting.
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One 30 H. P. Single Drum Electric Hoist, $250.00.
Two Steam Hoists, 7¼x10 Double Drum, $150.00 Each.
Lot of New Wire Rope. All Sizes from ⅝" to 2¼" Dia. For Hoisting Guylines, Draglines, Cableway, Etc. Very Low Prices.

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4" Domestic single diaphram pump also lot of centrifugal pumps.

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2—Ingersoll-Rand horizontal 2-stage. 1—1245 cu. ft. with 200 or 300 HP 2200 V. G. E. syn. motor. 1—870 cu. ft. with 150 HP G. E. slip ring motor.

3—Single Stage: 3 horizontal including 1 Sullivan 518 ft. Class WG6, 1 Chicago Pneumatic Tool 350′ NSB, Ingersoll-Rand 92′ ER-1.

1—G. E. centrifugal compressor 9000 cu. ft. at 2 lbs. pressure, direct connected to 120 HP G. E. A/C 220 V. motor.

3—Low pressure. 1—I. R. 1130 cu. ft. capacity at 40 lbs., direct connected to 108 HP Diesel engine. 1—Sullivan W. G.-6 horizontal 1151 cu. ft. capacity 30 lbs. pressure with 125 HP G. E. motor. 1—Bury Class L 1000 cu. ft. 30 lb. pressure with 75 HP G. E. motor.

15—Portable, gasoline driven; cap. 21, 92, 118, 210, 240, 310 cu. ft. Ingersoll-Rand, Sullivan, Chicago Pneumatic, Schramm, Domestic and Metalweld.

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9—Bins. 2—Butler; 1—135 yd. 3-compartment; 1—75-yd. 2-compartment with scales; 5—Blaw-Knox; 2—117-ton; 1—72-ton; 1—50-ton; 1—35-ton 2-compartment with or without scales. 1—54-yd. Johnson. 1—Johnson 300 bbl. cap. fully enclosed cement bin with scale.

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Standard gauge: 8—Western 20-yd. air dump; 7 Koppel 6-yd.

42″ gauge: 48 Koppel 2½-yd. all steel one way side dump.

36″ gauge: 67 Koppel, Western and Continental 5-yd. two way dump; 16 Continental 2-yd. two way dump; 6 Koppel 6-ton flat.

24″ gauge: 45 Koppel and Western 1½, 1 and ½ yd. V-shaped dump cars.

40—24″ gauge: Lakewood and Koppel 10,000 lb. cap. roller bearing flat cars.

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9—Port. Belt Conveyors with steel frame, gas or elec. pr. 18″ and 24″ Barber-Greene and Chicago Automatic.

6—Weller, Chain Belt and Link-Belt vertical bucket elevators on chain or belt, all lengths and capacities up to 175 yds. per hour.

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1—Northwest Type M. Serial No. 2334, 60 ft. boom, 1½ yd. dragline or clamshell bucket.

1—Northwest No. 104 Serial No. 2079, 45 ft. boom; 1¼ yd. bucket.

1—Industrial Brownhoist Type D. C. Ser. No. 5176 40′ boom crawler crane with Buda Diesel engine.

1—Link-Belt K-25 Ser. No. 1521, with 40′ boom, crawler crane.

1—Link-Belt gasoline, Model K-1; 10 ton 50 ft. boom; shop No. K-1024.

1—Erie B-2 steam crane No. 3900; 40 ft. boom.

1—Brownhoist No. 2 gasoline crane: 10 ton cap.; 40 ft. boom; shop No. 9964.

1—Industrial Brownhoist, type CC crawler crane, 36 ft. boom, ½ yd. cap. Chop No. 5071.

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1—30 ton American No. 1470, 70 ft. boom, 8-wheel MCB trucks.

1—30 ton Ohio No. 3367; 50 ft. boom on 8 wh. MCB trucks.

1—25 ton Ohio No. 1780; 60 ft. boom on 8 wh. MCB trucks.

1—25 ton American No. 1558; 50 ft. boom on 8 wh. MCB trucks.

1—25 ton Industrial Type G—No. 4361; 50 ft. boom on 8 wh. MCB trucks.

CRUSHERS

1—Symons coarse cone crusher, size No. 5½, SU No. 521; capacity 450 tons per hour of 2½″ material—130 tons per hour of ½″ material; weight 85,000 lbs.

1—Set Power and Mining Machinery Co. crushing rolls, size 42″x16″; rated capacity 15-20 tons per hour of ⅜″ material; weight 41,000 lbs.

1—24″x36″ Farrell jaw crusher in first class condition. Wt. 41,000 lbs.

1—No. 6 Champion jaw crusher. No. U-1075-4; jaw opening 12″x6″; capacity 24-35 tons per hour of 2″ material; Weight 20,000 lbs. Like new.

2—No. 3 McCulley gyratory crushers; size of each opening 7″x28″; capacity 25 tons per hour of 2¾″ material; 11 tons per hour of 1¼″ material; weight 17,000 lbs.

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3—Steel Stiff Leg; 1—10 ton Insley, 80′ boom; 1—10 ton American, 80′ boom; 1—5 ton Modern with 50′ boom.

12—Wood stiff leg derricks: All sizes up to 10 ton.

11—Steel Guy: 1 Terry 15 ton, 90′ boom; 9 American 15 ton, 100′ boom.

1—10-ton Dobbie 70 ft. mast, 58 ft. boom, bullwheel.

HOISTS

65—Gasoline, Steam and Electric, including 1 Thomas 150 HP Special Class L 2-speed electric cableway excavator hoist. Will handle 2 yd. bucket.

LOADERS

2—Barber-Greene Model 42-A Crawler mounted bucket loaders. Cap. 1¼ yd. per min.

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Gas: 2—12 ton Plymouth 36″ gauge, 10—8 ton Vulcan St. Ga., 3—8 ton Plymouths; 4—7-ton Whitcombs 36″ ga., 3—3-ton Brookville St. Ga.

13—24″ gauge gas locomotives; 5—7-ton Plymouths; 4—7-ton Whitcombs; 3—4-ton Plymouths; 1—3-ton Plymouth.

2—Steam locomotives; 1—Porter 20-ton No. 6753, 36″ gauge; 1—Davenport 19-ton No. 2036 standard gauge.

PNEUMATIC TOOLS

4—Gardner Denver wagon or derrick drills with model 21 or 17 Gardner drills for channelling.

80—Ingersoll-Rand X-71, S-49, DCR 23, Gardner Denver Models 21, 17 and 37, Sullivan FG3, jackhammer, column and tripod drills.

PUMPS

100—Centrifugal pumps—gas, electric and belt driven, all sizes; also diaphragm, gravel and dredging pumps. All sizes.

SCREENS

2—P & M Roller type, 48″ by 18′ long.

1—Allis Chalmers, roller type 51″ dia. by 21 ft. long.

1—Good Roads 30″ dia x 12′ roller type.

1—S. & A. double deck 3′x6′ vibrating screen.

SHOVELS

1—Northwest Model 105 combination shovel and crane No. 1846, ⅞ yd. shovel dipper, 40 ft. crane boom.

1—Industrial Brownhoist Type D.C. Ser. No. 5176 Buda Diesel engine.

1—Link-Belt K-25 Ser. No. 1521, 23 ft. boom, 16-ft. dipper stick, ¾ yd. dipper.

3—Link-Belt shovel attachments for Models K-55, K-44, K-42, K-38, K-25 or K-2.

TRACTORS

8—Tractors: 3—Monarch 75's; 3—Caterpillar 60's; 2—Caterpillar 30's with bulldozers.

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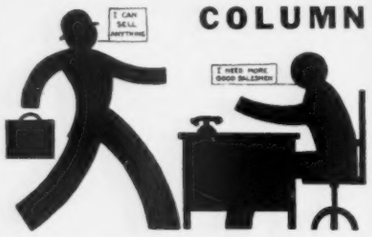

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We have some open territories and would like to make Distributor connections for handling steel bins, weighing batchers and scales and material handling and road building equipment. THE HELTZEL STEEL FORM & IRON COMPANY, Warren, Ohio.

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Used Equipment in Good Condition

11x20 Nek England Road Machinery Crusher

2000 feet 4" diameter pipe.

45 H.P. Gas Engine, mounted to Laurence Pump, 3" suction, 4" discharge.

36" diameter x 16' Universal Screen.

36" diameter x 8' scalping screen.

½ yard Sauerman Bucket.

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20 and 40 Ton Steam Loco. Cranes.
No. 37 Kennedy Gearless Gyratory.
12x26; 24, 28, & 42x36 Jaw Crushers.
1, 2, & 3 yd. Diesel & Electric Shovels.
120, 240, 360, 560 H.P. Fairbanks Diesels.
400 KW Skinner Universal Uniflow set.
Write for Bulletin No. 110.
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Power Equipment, Crushers, Rail, Pipe, Cars, Locomotives, Cranes, Buckets.

FOR SALE

100 HP G. E. slip ring motor 3/60/220/690.
200 HP Allis-Chalmers slip ring motor 2/60/2200/690.
135 HP Phila. gear reducer 860/200 RPM.
5-ton new Link Belt mono rail hoist, cab control, 220 volt D.C.
We carry a complete stock of welding machinery.
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3—Lawrence centrifugal pumps, never used, 8" suction, 6" discharge, No. 5256, pulleys 12"x10" ball thrust bearings, cast iron bases. $100.00 each.
2—8 ton, 36" gauge gas. locomotives, like new, used on one job.

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LIMA CRANE & SHOVEL

Model 106—50 ft. boom — Crane capacity 25 tons.
Shovel Front—1½ cu. yd.—never used.
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1—36"x42" Farrel Type, Model 300B, Jaw Crusher, built by Earl C. Bacon.
3—Erie, Type B-2, Steam Shovels, ⅞ yard Dippers, mounted on Traction Wheels, very cheap.
1—Nelson, Q-7 self feeding Truck Loader, McCormick Deering Power, Crawler Mounted.
1—Each 100 cu. ft., 220 cu. ft. and 310 cu. ft. Chicago Pneumatic, Portable, Gasoline Driven Air Compressors. Excellent condition.
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1—3 ft. Symons Cone Crus'er.
2—Ingersoll Rand Wagon Drills.
1—50B Bucyrus 2 yd. Steam Shovel

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1—No. 5 Allis-Chalmers Gyratory Crusher. $400.00.
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1—150 H.P. Allis-Chalmers Electric Motor, 700 RPM, 2200 Volts 3-phase 60 cycle, newly rewound, and smaller sizes.
1—80 H.P. Wisconsin Gasoline Power Unit, rebuilt, $700.00.
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1—24x36 Farrel Type 14-B.
Champion Jaw Crushers—Nos. 3, 4, 4½, 5, 6, and 1040.
Bucket Elevators—Continuous and centrifugal —6" to 26" width.

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PRICED FOR IMMEDIATE SALE
3—18-Ton **Vulcan Dinky Steam Locomotives,** 36" ga.
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1—**Track Shifter.**
All in good condition; locomotives completely rebuilt. Equipment may be inspected at Kansas City. Any reasonable offer will be accepted. Wire or phone for details.
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One 2-Yd. Marion All-Electric Shovel, on "Cats."—with MG set, 34 ft. Boom, easily converted to dragline, excellent operating condition. Bargain.
One 25-Ton Link-Belt Locomotive Crane, 50 ft. Boom with 1½ Yd. Bucket. Modern.
One 50-Ton Std. Gauge American Steam Locomotive. Address Box 121, Pit and Quarry Publications, 538 S. Clark St., Chicago.

JAW CRUSHER

9 x 24 "Cedar Rapids" Crusher rebuilt —fine condition—price reasonable.

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One ⅝ yard full revolving gasoline crawler shovel or 35 foot boom crane with ⅜ yard clamshell bucket. Price reasonable.

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Good Used Crushing, Pulverizing, Drying and Filtering Equipment

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1—No. 1 Raymond Pulverizer with air sep.
5—Raymond Pulverizers, No. 0000, 00, No. 1, 3.
1—12″ Mikro Pulverizer with A.C. Motors.
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8—Hardinge Ball and Pebble Mills, 4½′x16″, 6x22, 6x36, 7x36, 8x30.
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2—6′6″x60′ Vulcan Rotary Kilns.
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1—24x72″ Magnetic Pulley, with m.g. set.
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2—20″x14″, 36x16 Sturtevant Crushing Rolls.
6—3′x5′, 4x5, 4x7 Tyler Hummer Screens.
2—Generator Sets for Tyler Screens —G4, G8.
2—4′x6′, 5′x8′ Niagara roller bearing Screens.
9—Rotex Screens Nos. 14, 52, 61.
1—8′ Gayco Air Separator, No. 26.

SEND FOR BULLETIN of our regular stock of Crushers; Vibrating Screens; Ball, Rod and Tube Mills; Air Compressors; Rotary Kilns and Dryers; Hardinge Ball and Pebble Mills; Raymond and other Pulverizers; Air Classifiers; Thickeners; Wet Classifiers; Filter Presses; Continuous Filters, etc. NOTE—We buy your idle equipment for cash.

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3—72-ton American 6-wheel Switcher with separate tenders.
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2—50-ton American 4-wheel saddle tanks.
4—40-ton American 4-wheel saddle tanks.
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2—33-ton Vulcan 4-wheel saddle tanks.
2—30-ton American 4-wheel saddle tanks.

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Two Robins 24″x225′ Belt Conveyors.
Robins 18″x170′ Belt Conveyor.
Conveyor Idlers and Pulleys, 18″ and 24″.
Portable 14″x24′ Flat Conveyor, LeRoi.
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Portable 24″ Gauge Track and Switches.
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Nos. 1, 3, 4, 5, 6, 7½ Gates Gyratories.
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18″, 24″, 36″, 48″ Symons Disc Crushers.
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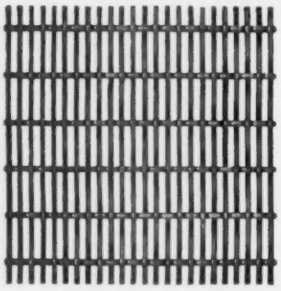

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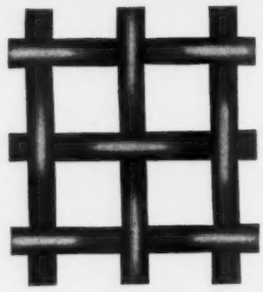

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L-1 30 lb. Rock Drill; L-2 45 lb. Rock Drill; L-9 55 lb. Rock Drill.

*Lively action—Superior drilling speed.

*Low air consumption—higher efficiency on portable compressors.

*Easy to operate—runners like them.

*Materials—Accurately machined and ground.

*Durability—Finest materials and workmanship.

WAGON MOUNTINGS

*Mobility.

*Increased footage—drifter production with hand-held drill mobility.

*Versatility—Holes, any angle; snake holes, toe holes, down holes, holes close to the floor or close to the face.

Shown in circle—Sullivan L-2, 45 lb. Rock Drill.

Distinctive SULLIVAN Features

TOWER MOUNTINGS

*Makes deep hole drilling profitable.

DETACHABLE BITS

Departure from conventional design. Result:

*40-60% more hole.

*Reduction in drill steel investment.

*Lower cost per foot drilled.

SULLIVAN ALSO MAKES:

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Large illustration shows Sullivan Tower Mounting.

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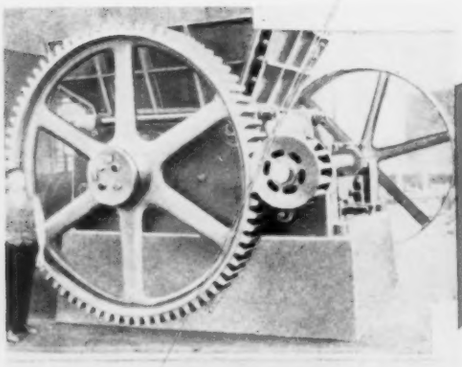
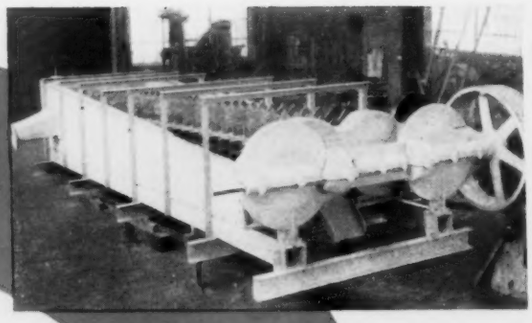
McLANAHAN

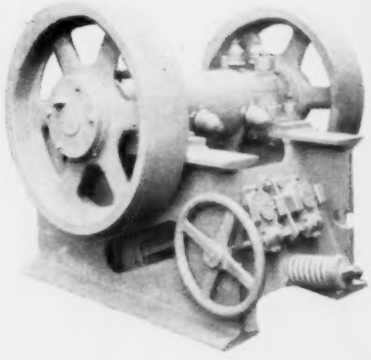
PREPARATION MACHINERY



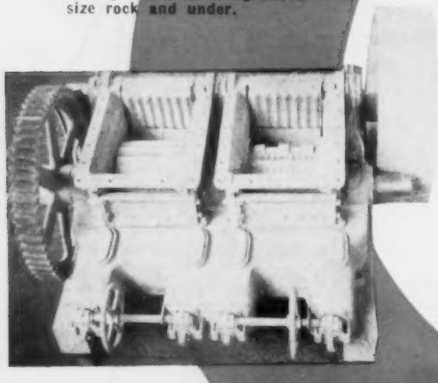
Right: McLanahan patented welded steel logs, driven separately by enclosed gears running in oil, for removing toughest clays and soft rock.



All-Steel adjustable force-feed and discharge Jaw Crusher adapted for use in portable, semi-portable and stationary plants.

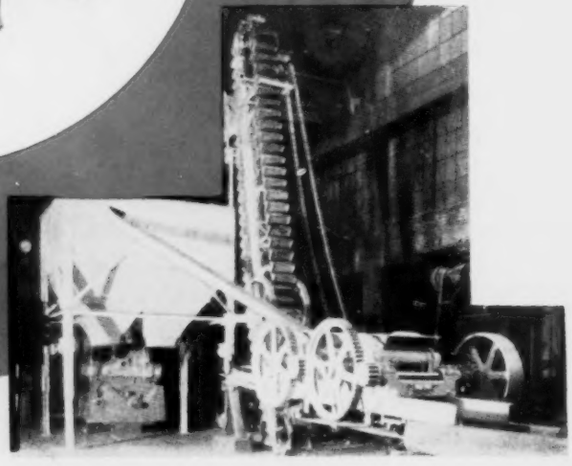


Heavy-duty Single Roll Crusher, built in any size or capacity for primary or secondary work, handling shovel size rock and under.

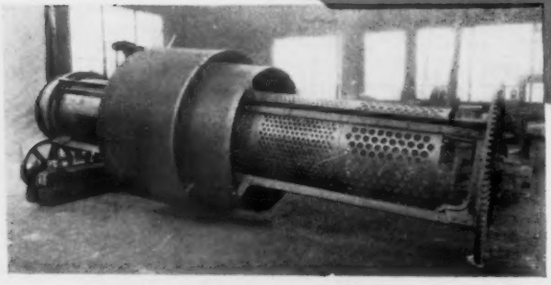


Double-Roll All-Steel Patented Segment-Roll Crusher. Steel gear guard and roll cover removed. Built in any size for various capacities.

Twin Primary and Secondary Crusher in one frame with single drive. "Two-in-one" equipment.



Complete Portable Crushing Plants furnished for a wide range of capacities and products.



Combination Cylinder Washer with triple shell sizing screens for economy in power and saving in space.

YOU are entering a new year of production, and we are beginning our second century in the manufacture of crushing, washing and screening machinery, which will enable you to increase capacities, reduce costs and handle tougher jobs than ever before. Protect your investment by using McLanahan time-proven equipment, which has been brought to peak efficiency by continuous development since 1835. Write for details.

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